Olin
427 N. SHAMROCK STREET
EAST ALTON, ILLINOIS 62024-1197

July 13, 1999

CERTIFIED MAIL

Ms. Juana Rojo
Corrective Action Project Manager
U.S. Environmental Protection Agency, Region V
77 West Jackson Boulevard – DW-9J
Chicago, Illinois 60604-3590

Subject: **Response to USEPA Comments**
Screening Ecological Risk Assessment
Olin Corporation
East Alton, Illinois
ILD006271696

Dear Juana:

This letter is to document the agreement reached between USEPA and Olin during a conference call held on July 12, 1999. The conference call was made in response to USEPA's comments concerning Olin's revised Screening Ecological Risk Assessment Report (revised January 1999) (SERA Report). The USEPA's comments, dated June 10, 1999, were primarily directed at the use of averaging to eliminate constituents of ecological concern (COECs) and the elimination of pathways from further evaluation in Phase II of the RFI.

USEPA's June 10, 1999 comments indicated that screening would not be allowed against average values unless there is a statistically valid assessment that the average represents the entire SWMU. During the conference call Olin agreed to revise the SERA Report to include those constituents previously eliminated by averaging as COECs. USEPA was also informed by Olin of its intent to utilize averaging of values during the evaluation of data collected for the preliminary ecological risk assessment (PERA) as part of the Phase II RFI activities. Data collection and management for these activities will be described in the Phase II RFI Work Plan.

In regard to pathway elimination, USEPA expressed concern in its June 10, 1999 comments that the information presented in Table 4 of the SERA Report indicates that potential exposure pathways have been eliminated from further consideration. Olin did not eliminate any pathways during performance of the SERA. Pathways will be assessed during Phase II of the RFI using data gathered during Phase I and Phase II activities. The need for further assessment of a SWMU, if any, will be based on the data collected during the Phase I and Phase II activities.

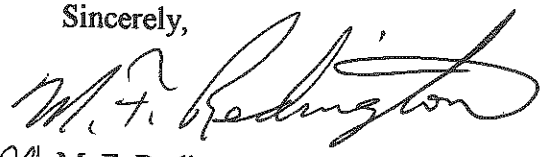
During the conference call Mr. William Enriquez of USEPA requested that Olin provide in the revised SERA Report a list of questions to be answered during Phase II of the RFI concerning the COECs. Olin recognizes that additional data must be collected during Phase II to further assess the COECs. Furthermore, Olin believes that it is most appropriate to address these issues in the Phase II RFI Work Plan, which will include the PERA Work Plan, and not in the revised SERA Report. Olin understands that USEPA is in agreement with this position.

Olin has agreed to revise the SERA Report and submit it to USEPA on or before August 9, 1999. This revision will consist of adding those constituents previously eliminated by averaging and incorporation of statements indicating that potential exposure pathways were not eliminated during the SERA process.

It is Olin's understanding that the aforementioned changes are all that is needed for the USEPA to approve the SERA, and in turn the Phase I RFI Report. As stated in our February 25, 1999, letter to Ms. Rojo, Olin has suspended Phase II RFI Work Plan development activities pending resolution of all issues associated with the SERA. Once Olin has received approval from USEPA for Phase I of the RFI, including the SERA, we will then authorize ADVENT to resume Phase II RFI Work Plan preparation. Olin will submit a draft this Work Plan, including the PERA Work Plan, to USEPA within 120 days from receipt of approval of the entire Phase I RFI.

Thank you for your continued support on this matter. Olin is very interested in moving this process forward and believes that we are now in a position to approve Phase I and move on to Phase II of this project. If you have any questions concerning this correspondence, please contact Mr. Phil Sutton at 618-258-3780 or myself at 618-258-3633.

Sincerely,



M. F. Redington, Manager
Utilities and Environmental Services

Cc: R. A. Coomes – ADVENT
R. E. Mooshegian – ADVENT
J. A. Viebrock – ADVENT
P. L. Sutton - Olin

William

Olin

427 N. SHAMROCK STREET
EAST ALTON, ILLINOIS 62024-1197

February 25, 1999

Ms. Juana Rojo
Corrective Action Project Manager
U.S. Environmental Protection Agency, Region V
DW-8J
77 West Jackson Boulevard
Chicago, Illinois 60604-3590

Subject: USEPA Draft Comments (facsimile date February 10, 1999)
Screening Ecological Risk Assessment (Revised January 1999)
Olin Corporation
East Alton, Illinois
ILD006271696

Dear Ms. Rojo:

Olin has reviewed the DRAFT Comments from Mr. William Enriquez of USEPA regarding the above referenced Screening Ecological Risk Assessment (Revised January 1999) (Revised SERA). These comments were transmitted to Olin via facsimile on Wednesday, February 10, 1999.

The purpose of this letter is to provide a preliminary response to the Agency's DRAFT Comments, and to request review and finalization of the comments.

Background

The USEPA approved Olin's Screening Ecological Risk Assessment Work Plan via a letter dated February 23, 1998. Implementation of this plan resulted in Olin's submittal of the Screening Ecological Risk Assessment Report (Original SERA) on June 23, 1998. The Agency's comments regarding the Original SERA were developed by Mr. Enriquez and dated September 25, 1998 (attached).

These comments (attached for reference) began by stating that the SERA report *"is approved..."* while requiring that ***TWO*** issues be addressed. The first issue requiring attention concerned habitat types within the facility's solid waste management units (SWMUs), and the potential need for additional screening. The second issue questioned the appropriateness of eliminating specific constituents from further consideration when SWMU and media specific data indicates that screening levels have been exceeded by up to *"one order of magnitude"*. Mr. Enriquez's written comments regarding the Original SERA conclude with the following statement:

> *"Other than these two concerns, this is a good study, and Olin is approved to initiate the PERA."*

On December 9, 1998, Olin representatives (Mr. Mike Redington, Mr. Bob Mooshegian, Mr. Mark Sellers, Dr. Mark Klan and Mr. Rich Coomes) attended a meeting at the USEPA Region V offices with Ms. Rojo, Mr. Enriquez and Mr. Daniel Mazur to discuss Mr. Enriquez's written comments. The following items summarize the results of the meeting:

Issue No. 1 - habitat type

- Olin and the Agency agreed that SWMU 8 includes an seasonal open water habitat.
- Olin and the Agency agreed that SWMU 9B includes a seasonal open water habitat.
- Olin and the Agency agreed that the SERA process is based on existing data, and that "additional screening" which would require additional sampling and analysis is not appropriate for the SERA portion of the Ecological Risk Assessment process. In accordance with the approved work plan, only habitat types identified during previous site visits supporting the Phase I RFI Report were to be used during the SERA process. Needs for additional data and habitat types would be addressed during planning of the Preliminary Ecological Risk Assessment (PERA) as part of the facility's Phase II RFI.

Issue No. 2 – *"order of magnitude"* exceedances

- Olin and the Agency agreed that additional technical discussion will be required to justify elimination of constituents based on the *"order of magnitude"* screening presented in the Original SERA. Such technical discussion will be provided in the Phase II RFI Work Plan which will include the PERA Work Plan.

Revised SERA

Based on Mr. Enriquez's written comments, and the agreements reached during the December 9, 1998 meeting, Olin submitted the Revised SERA on or about January 15, 1999. The Revised SERA addressed both issues identified by Mr. Enriquez as described below:

Issue No. 1 – habitat type

- Table 1 was modified to include open water as a habitat type for SWMU 8.
- Table 1 was modified to include open water as a habitat type for SWMU 9B.

Issue No. 2 – "order of magnitude" exceedances

- All constituents, with the exceptions of specific occurrences in SWMU 8 and SWMU 11, which were eliminated for further consideration in the Original SERA, were **retained** for further consideration in the Revised SERA.

Agency's DRAFT Comments to Revised SERA

On February 10, 1999, Olin received DRAFT comments regarding the Revised SERA from Mr. Enriquez. These comments begin with the following statement:

> *"Their revisions do not address the questions raised in our first set of comments."*

Olin strongly disagrees with Mr. Enriquez's opening comment, and assert that the Revised SERA specifically addresses the questions raised in the *"first set of comments"* as described in the previous section of this correspondence.

The DRAFT Comments continue by referring to eight issues, of which seven are completely unrelated to the *"first set"* of written comments regarding the Original SERA. The seven new issues identified by Mr. Enriquez focus on portions of the Revised SERA which were not changed from the *"approved"* (September 25, 1998 Memorandum, attached) portion of the Original SERA. Olin believes that identification of new issues regarding the previously *"approved"* portions of the Original SERA, is inappropriate.

The following items summarize Mr. Enriquez's concerns as transmitted on February 10, 1999 and Olin's response. For ease in reading, paraphrased summaries of the Agency's DRAFT Comments are in *italics*, while Olin's responses are in regular type.

- *The DRAFT Comments express concern that mechanisms for assessing migration beyond SWMU boundaries are not identified in the Revised SERA.*

  The SERA report is not intended to serve as a work plan, and therefore does not present detailed assessment plans. The Phase II RFI Work Plan will identify additional site assessment activities required to support the PERA process for constituents identified in the SERA. These activities will be an integral part of Phase II RFI activities.

- *The DRAFT Comments express concern regarding the last paragraph of page 13[of the Revised SERA] which briefly discusses the development of ecological screening levels.*

  The subject paragraph describes technical issues which commonly lead to the conservative development of ecological screening levels. The paragraph also notes that despite the use of conservative assumptions, the screening levels

have been used without modification. This paragraph does not describe any mechanism used to eliminate constituents from further consideration. In fact, the Revised SERA retains those constituents which were dropped in the Original SERA where the "one order of magnitude" screening had been previously applied. Therefore, Olin believes that the DRAFT Comments regarding the subject paragraph have been appropriately addressed within the Revised SERA.

- *The DRAFT Comments express concern regarding the comparison of average constituent concentrations to Ecological Screening Levels, and suggests that average values not be used during the screening process.*

  The Agency's first set of written comments indicated that the Original SERA was *"approved"* while requiring that ***TWO*** issues be addressed. The subject issues involved SWMU habitat types and the use of *"order of magnitude"* screening. The Revised SERA reflected the agreements reached with the Agency regarding both issues during the December 9, 1998 meeting in Chicago. Therefore, Olin believes that it is inappropriate to raise new issues regarding the *"approved"* portions of Original SERA that have not been modified.

- *The DRAFT Comments suggest that the ground water screening logic for SWMU 5 is inappropriate because the well used during the screening process may be up-gradient.*

  The SERA process specifically included the comparison of only existing media quality data to Ecological Screening Levels to identify constituents requiring additional assessment. Therefore, all available data, up-gradient or down-gradient, was used during the assessment. The lack of down-gradient ground water data does not preclude the SERA process, and the SERA report is not intended to serve as a work plan. The PERA process to be implemented during Phase II RFI activities will include the required site assessment activities for all constituents identified during the SERA process.

  In addition, the issue regarding SWMU 5 ground water focuses on a previously *"approved"* portion of the Original SERA that has not been modified.

- *The DRAFT Comments suggest that the description of SWMU 6 is inappropriate.*

  Based upon a review of the description and site conditions, Olin believes that the SWMU 6 description is accurate. In addition, the issue regarding the

SWMU 6 description focuses on a previously *"approved"* portion of the Original SERA that has not been modified.

- *The DRAFT Comments state that Di-n-butyl phthalate should not be eliminated from further consideration at SWMUs 8 and 11.*

  Olin agrees that Di-n-butyl phthalate occurrences in SWMUs 8 and 11 exceed the recommended Ecological Screening Level. Further evaluation of the risks associated with the constituent's occurrence may be developed during the PERA process as part of the Phase II RFI Work Plan.

- *The DRAFT comments suggest that FDXMW-113 was not appropriate for screening ground water quality at SWMU 15B.*

  The SERA process specifically included the comparison of all existing media quality data to Ecological Screening Levels to identify constituents requiring additional assessment. Therefore, all available data, up-gradient or down-gradient, was used during the assessment. In fact, as shown in Table 2 of the Original and Revised SERA, ground water quality from four wells (MW-101, MW-102, MW-103 and MW-104) was used during the SERA screening process. The lack of down-gradient ground water data does not preclude the SERA process, and the SERA report is not intended to serve as a work plan. The PERA process to be implemented during Phase II RFI activities will include the required site assessment activities for all constituents identified during the SERA process.

  In addition, the issue regarding SWMU 15B ground water focuses on a previously *"approved"* portion of the Original SERA that has not been modified.

- *The DRAFT comments request additional information regarding ground water flow in the area of SWMU 18.*

  As stated previously, the SERA process is based on existing data and the SERA report is not a work plan. Additional assessment activities will be identified during the PERA process as part of the Phase II RFI Work Plan. This issue focuses on a previously *"approved"* portion of the Original SERA that has not been modified.

The results of the SERA process directly impact the scope of assessment activities being developed for Olin's Phase II RFI work. The SERA results can affect changes to the media to be sampled and analytical requirements for each media within each SWMU.

Therefore, Phase II RFI Work Plan development can not proceed until the SERA report has been finalized. Olin had previously initiated preparation of the Phase II RFI Work Plan including preliminary scoping of assessment activities based upon the Agency's *"approval"* of the Original SERA pending the *"two"* issues.

Because the SERA results are integral to the development of the Phase II RFI Work Plan, and due to the potential affect on assessment activity requirements, Olin has suspended all Work Plan development activity. At this time, due to the uncertainty of the SERA approval, Olin is unable to estimate the impact to the project schedule and level of effort required to finalize the Work Plan. In addition, because the SERA report has not yet been finalized, there is basis for the contention that the 120-day period allowed for development of the Phase II RFI Work Plan has not yet begun. Therefore, Olin suggests that the Phase II RFI schedule be suspended until the Agency's final comments regarding the Revised SERA are available, and their impact can be assessed. Upon receipt and review of the Agency's finalized comments to the Revised SERA, and resolution of any issues identified in the final comments, Olin will develop and propose a revised schedule for submittal of the Phase II RFI Work Plan.

Olin recognizes and appreciates the Agency's efforts to provide the DRAFT Comments during our Phase II RFI Work Plan preparation activities. We also look forward to the Agency's consideration of the information provided herein during finalization of comments regarding the Revised SERA.

Thank you for your consideration, and we look forward to continuing the cooperative effort toward resolution of SERA issues and continuation of the RFI process. If you have any questions, please contact the undersigned at your convenience.

Sincerely,

M. F. Redington, Manager
Utilities and Environmental Services

JWP 2/25/99

Attachment

cc: R. A. Coomes - Advent Environmental
R. E. Mooshegian - Advent Environmental
J. A. Viebrock - Advent Environmental
L. W. Pattan - Olin

Memo

draft

To: Juana Rojo
From: William Enriquez
Date:
Subject: Olin's Revised SERA, January 1999

Their revisions do not address the questions we raised in our first set of comments. I still don't understand how they are going confirm that contamination is not migrating from the SWMU boundaries they have identified and into the soils, groundwater, sediments and surface waters "downstream." Also, I don't agree with their characterization of our Ecological Screening Levels in the last paragraph of page 13. This paragraph is misleading, since they are generally quoting "the scientific literature" and not actually giving a citation. It looks like they are just assuming that concentrations just above the screening level are not ecologically significant and that they haven't really looked into each issue. This paragraph needs to be modified, and I need a better understanding of how they are going to verify the presence or absence of "hot spots" in their SWMUs, and whether these "hot spots" have a fate and transport problem.

I consulted with our in-house Statistician, Art Lubin, on the remaining approaches they are using to screen out COECs. He recommends that we don't allow the averaging approach since these SWMUs are not homogeneous deposits of waste. He recommended, instead, that we allow the cleaner samples that passed the screen to represent clean areas within the SWMUs, and the samples that failed the screen to remain and identify potential "hot zones" that need further characterization. In other words, we can work in conjunction with Olin, with these results to screen out portions of the SWMUs for certain contaminates, and still further characterize some hot spots. So at this point, I recommend that we do not accept averaged results for comparison to screening levels. Before we could accept such an approach we would need more details on how much of the SWMU these samples are intended to represent and how much variability is there between these samples and the background samples. I would also like to see more details regarding the origin of the background values included in this report.

SWMU 5 - The groundwater logic for this unit is not acceptable since the monitoring well appears to be upstream of the unit. I realize that we do not have a ground water flow map to work from, but it is my guess from the topography of the surface and bedrock and the location of the nearby tributary that well FDX-MW-110 is upstream of SWMU 5 & 6 and could possibly act as a groundwater reference for background in this area.

SWMU 6 is described as "grass cover over flat areas," and I recall a fairly steep slope at this unit. This description should be improved.

SWMU 8 & 11 - Di-n-butyl phthalate should not be eliminated as a COEC at this point of our ERA process, because the reported concentrations of 0.49 mg/Kg and 6.9 mg/Kg represent a hazard quotient (HQ) of 4.6 and 46 compared to the screening values of 0.11 mg/Kg and 0.15 mg/Kg. These HQ is well above the acceptable level of 1, and therefore it is too early to drop this COEC.

SWMU 15B - They did not identify what well was sampled for this groundwater analysis. The closest one appears to be FDXMW113. It would help if we had and educated opinion as to the ground water flow in this area. If the groundwater flows in the direction of the bedrock topography, then this well appears to be upstream of unit 15B. Since this area has groundwater contamination, they should analyze a groundwater sample down gradient of this unit.

SWMU 18 - It would help my evaluation if I had a better understanding of the ground water flow in this area.

Olin
427 N. SHAMROCK STREET
EAST ALTON, ILLINOIS 62024-1197

December 15, 1998

CERTIFIED MAIL

Ms. Juana Rojo
Corrective Action Project Manager
Waste Management Branch
U.S. EPA, Region V
77 West Jackson Boulevard - DW8J
Chicago, Illinois 60604-3590

Re: Screening Ecological Risk Assessment Report
Olin Brass and Winchester, Inc.
Main Plant Facility
East Alton, Illinois
ILD006271696

Dear Juana:

We appreciate the opportunity to meet with you, William Enriquez, and Dan Mazur on December 9, 1998 to discuss our progress and the issues that face us as we move forward in developing the Phase II RFI Work Plan (Work Plan) for the referenced facility. As we have discussed, Olin has begun preparation of the Work Plan and needed resolution of several specific issues raised by Mr. Enriquez in his memo to you dated September 25, 1998 contained in your letter of November 3, 1998 regarding comments on the SERA Report. Resolution of these issues is considered critical by Olin so that the SERA Report may be approved and the Ecological Risk Assessment Process may be integrated appropriately into the Phase II RFI work that is being planned at this time.

As discussed in the meeting, Olin and USEPA have made significant progress to date and we are pleased with the cooperative atmosphere of the meeting. We believe we have reached agreement on the following points and wish to relay this information to you for comment so that Olin's technical consultant may continue preparing the appropriate revisions to the SERA Report for submission to the USEPA by January 15, 1999. These points are as follows.

- The additional screening for other habitat types as outlined in Mr. Enriquez's memo is not possible at this time for several reasons. First, all available data from the Phase I Work were used in the screening process as agreed with the USEPA. There are no additional data to perform the requested screen. Secondly, with the exception of SWMUs 8 and 9B, Olin does not agree that the suggested habitats exist within the referenced SWMUs. The habitat types that were considered in the SERA were those agreed upon by the USEPA in their approval of our SERA Work Plan. We revisited each of the SWMUs on December 8 to reconfirm our August 1998 observations.

Based on these observations, we agree with Mr. Enriquez and have concluded that Seasonal Open Water (SOW) may exist for enough of the year in SWMUs 8 and 9B to warrant consideration of this habitat type in the PERA. However, other SWMU specific habitat types described in the memo do not exist within the referenced SWMUs. Therefore, it is inappropriate to revise the habitat types in the SERA Report, except for the addition of SOW in SWMUs 8 and 9B, for evaluation in the PERA and Phase II RFI work. A more definitive description of habitat types located within the SWMUs may be provided in the PERA Report. Additionally, expressed concerns related to fate and transport of Constituents of Ecological Concern (COECs) from SWMUs will be addressed, if necessary, based on the conclusions from the Phase II results. Sampling beyond the established boundaries of the SWMUs would be premature at this time.

- The application of "Order of Magnitude" (OM) logic to the screening process requires further discussion. We understand that the USEPA desires Olin to provide additional technical justification for this application in the discussion of each SWMU in the Revised SERA Report (Revised Report). We understand that the USEPA will not likely consider an OM discussion of 2 orders in deciding which constituents to carry forward into the PERA but will consider our logic for up to one order in the Revised Report. If adequate justification for screening out a particular COEC is not available, then the COEC may be retained for evaluation in the Phase II activities.

Olin will submit the Revised Report by January 15, 1999. In order to keep the 120-day schedule for submission of the Draft Phase II RFI Work Plan, Olin will need final concurrence from the USEPA on the constituents and habitats to carry forward into the PERA and Phase II RFI by January 29, 1999. Therefore we request an expedited approval of the Revised Report to accomplish this goal. If approval of the Revised Report is not received by the aforementioned date, completion of the Draft Phase II RFI Work Plan may be delayed.

We are proceeding as outlined in this letter. If you are not in agreement with the understandings presented in this letter, please contact Mr. R. E. Mooshegian at 618-258-3548 immediately.

Sincerely,

M. F. Redington, Manager REM 12-15-98
Utilities and Environmental Services

cc: R. E. Mooshegian - Olin
M. A. Sellers - Advent Environmental

MEMORANDUM

to: Juana Rojo
from: William A. Enriquez
subject: Olin's Screening Ecological Risk Assessment
date: SEP 25 1998

We have reviewed Olin's SERA and find that this study is approved with the following two modifications. First, the TABLE 1: SOLID WASTE MANAGEMENT UNIT (SWMU) HABIT TYPES should be revised to reflect the habitat types that could be potentially influenced by the COECs of each SWMU as illustrated in the table below. Further screening are necessary to assess the potential of these SWMUs to affect surface water and sediments as outline in the table below. Also, this table does not utilize habitat descriptions such as Wet Lands (WL) or Ephemeral Wet Lands (EWL) as habitat types. Specifically it is missing the following SWMU-associated habitat types and ecological screens.

1 - Open field (OF) and Wet Meadow (WM) just north of bunker,
2 - Deciduous Forest/Wet (DF(W)) or EWL just north of unit needs surface water and sediment screens,
3&4 - Open water (OW) WL or EWL at SW end, needs surface water screen ,
7B - OW for the stream needs surface water screen,
8 - needs surface water and soils screens,
9B - OW
9C-OW
9D - WL, needs surface water and sediment screens,
10 - OW, why wasn't it screened?
11 - needs surface water screen,
17 - needs surface water and sediment screens,
18 - WL, needs surface water and sediment screens, and
19 - OW, needs surface water screen.

TABLE 1 must be reevaluated to better describe the habitats with the potential to receive adverse stress form the fate or transport of SWMU COECs. Also the need for more comprehensive screening as identified above should be incorporated into the final SERA report.

The second modification concerns the effective use of a screen one order of magnitude above the Recommended ESL (RESL). The RESL is the appropriate screening level. We do have updated values, as of 6/3/98, (see enclosed table) and we can allow Olin to adopt the most recent values if it serves to Olin's advantage. The Screening level shouldn't be adjusted at this point of the investigation without a sound scientific cause. Olin should reserve their justification to screen from further consideration these less than one order of magnitude COECs in the PERA. Most of the following COECs (generally PAHs and metals) that exceed the screen, by less than

an order of magnitude, can most likely be evaluated as a whole in a reasonable phase 2 study that will verify Olin's assumption that there is no ecological effects. It is important that these COECs are taken into consideration for some field tested results to verify Olin's assumptions of no significant ecological risk.

Acenaphthene, Antimony, Arsenic, Benzo(a)anthracene, Benzo(a)pyrene,Benzo(b)fluoranthene, Bis(2-ethylhexyl)phthalate, Cadmium, Chloroform, Chromium, Chrysene, Copper, Cyanide, 2,4-Dinitrotoluene, 2,6-Dinitrotoluene, Di-n-butyl phthalate, Diphenylamine, Fluoranthene, Fluorene, Indeno(1,2,3-cd)pyrene, Lead, Mercury, Naphthalene, N-Nitrosodiphenylamine, Nickel, Phenanthrene, Pyrene, Selenium, Silver, Vinyl chloride, and Zinc.

Other than these two concerns, this is a good study, and Olin is approved to initiate the PERA.

From: WILLIAM ENRIQUEZ WmEz
To: ROJO-JUANA
Subject: Olin's Concertual Approach for an ERA
Date: 5/27/97

I have reviewed Olin's Conceptual Approach to Performing an Ecological Risk Assessment dated April 18, 1997. This approach will be acceptable once we clear up the process outlined in the first paragraph of page two. I am concerned by the limits being imposed by the first sentence on the constituents to be evaluated. Lets re-discuss with them the need to focus the screen and then discuss the best method for accomplishing this delimit if needed. I have discussed this conceptual approach with Chuck Maurice and Dan Mazur, and I agree with their concerns regarding the use of human health soil screening level (SSLs) exceedances as equivalent to a first ecological screen. It doesn't make sense to develop Ecological Screening Levels (ESLs) and compare them only to constituents that exceeded the SSLs. If we go through the trouble to develop ESLs then we should use them for their intended purpose and screen with them.

One other observation that concerns me to a small extent, is their persistent reference to an impression that this assessment process is "voluntary." It is not the perception that bothers me, so long as the work gets done well, but a concern that "voluntary" at this point may be interpreted as discretionary if the results show the need for further work.

CC: CHO-HAK

Olin
427 N. SHAMROCK STREET
EAST ALTON, ILLINOIS 62024-1197

April 18, 1997

CERTIFIED MAIL

Ms. Juana Rojo
U.S. EPA, Region V
77 West Jackson Boulevard - HRP-8J
Chicago, Illinois 60604-3590

Re: Ecological Risk Assessment
Olin Corporation
Main Plant Facility
East Alton, Illinois
ILD006271696

Dear Juana:

Attached please find Olin's proposed conceptual approach to performing an ecological risk assessment (ERA) at the referenced facility as discussed during our March 14, 1997 conference call. The purpose of this document is to provide an outline and brief discussion of the ERA and risk management process to support the RFI activities performed at Olin's Main Plant Facility (MPF). The focus of the proposed approach is to address potential ecological concerns associated with those solid waste management units (SWMUs) identified during the Phase I RFI activities as requiring further assessment.

Olin has performed initial evaluations of habitat and submitted this information to USEPA as part of the Draft Phase I RFI Report. While the habitats at the MPF and SWMUs are observed to be healthy, an indication from Olin's perspective that no ecological impact from its operations exists, USEPA has indicated the need for further ERA activities.

Olin has proceeded with preparation of this proposal for an ERA on a voluntary basis in order to reach common ground with USEPA on this issue. We believe that our proposed resolution will address USEPA's concerns and requirements and will provide the information needed to approve the Draft Phase I RFI Report as the "Final Report" in its entirety so that Olin may proceed with preparation of the Phase II RFI Work Plan.

If, after completing your review, you wish to discuss the proposed conceptual approach, Olin and its consultant (Advent Environmental) are willing to come to Chicago to meet. If our proposal is acceptable to USEPA, Olin and Advent will then prepare and submit, for USEPA approval, a detailed Screening Ecological Risk Assessment (SERA) work plan. This work plan will identify the specific constituents and SWMUs to be assessed and the

screening criteria to be applied. Olin believes that USEPA approval of all facets of the proposed SERA activities is crucial to completing the work in a timely and efficient manner.

Olin would like to thank you for your continued support of this project and is ready to discuss this submittal at your convenience. If you have any questions or need additional information, please contact Mr. R. E. Mooshegian at (618)258-5050.

Sincerely,

M. F. Redington, Manager REM 4-18-97
Utilities and Environmental Services

Attachment

cc: M. A. Sellers - Advent Environmental
R. E. Mooshegian - Olin

CONCEPTUAL APPROACH TO PERFORMING AN ECOLOGICAL RISK ASSESSMENT AT THE OLIN CORPORATION MAIN PLANT FACILITY EAST ALTON, ILLINOIS (April 18, 1997)

INTRODUCTION

The potential ecological concerns and potential risks for a site in the RCRA regulatory process are determined through risk assessment. Ecological risk assessment (ERA) is defined as the process used to estimate the probability of adverse effects to biota. In order for risk to be present, a stressor such as a toxic chemical must be present and exposure to the stressor by a receptor must occur. Risk assessment evaluates toxicity, exposures, and receptors to estimate potential risks. By eliminating one of these factors (toxicity, exposure, or receptors), risks can be managed.

The methodology, scope, and intended purpose of the proposed ecological risk assessment/management process was developed from, and is consistent with, several USEPA guidance documents. The guidance includes, but is not limited to: *Proposed Ecological Guidelines for Ecological Risk Assessment* (Risk Assessment Forum, USEPA, Washington, DC, August 1996, EPA/630/R-95/002B); *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments, Internal Review Draft* (Environmental Response Team USEPA, Edison, NJ, June 1996); and *Ecological Risk Assessment Guidance for RCRA Corrective Action Region 5, Interim Draft* (USEPA Region 5 Waste Management Division, Chicago, IL, 1994). For the purposes of the proposed ERA, the August 1996 document will serve as the primary guidance document.

It is recognized throughout the aforementioned guidance that ERAs usually follow a tiered or phased approach and vary in complexity from simple screening evaluations to detailed, quantitative studies. The proposed ERA activities will be performed in a phased approach and at a level appropriate to support risk management decisions while not repeating work already performed during the Phase I RFI.

The proposed ERA process is iterative and allows decision points at the completion of each phase. These scientific/management decision points (SMDPs, discussed in the Superfund guidance) are opportunities to abbreviate the ecological risk assessment activities by demonstrating to the risk management team (including Region 5, Olin, and the risk assessor) that risk has been sufficiently managed. It is important to note that the assessment will evaluate ecological risks in the context of an active industrial facility and will incorporate "real-world" industrial use conditions into the assessment. If potential unacceptable ecological risks are identified, then additional steps may be required. The subsequent steps, however, will be focused on those areas identified in the initial screening phase.

PROPOSED ECOLOGICAL RISK ASSESSMENT APPROACH

The proposed ERA will be limited to only those constituents identified in the Phase I RFI Report which exceeded human health soil screening levels (SSLs) and the corresponding SWMUs at which these constituents were detected. Data Quality Levels approved by USEPA for the Phase I RFI will be utilized in performing the ERA and in identifying appropriate Ecological Screening Levels (ESLs). ESLs will be obtained from USEPA recommended sources such as Ambient Water Quality Criteria, Sediment Criteria, and Oak Ridge National laboratory's Ecological Preliminary Remediation Goals. Constituents which exceeded human health SSLs and for which ESLs do not exist, will not be evaluated during the ERA .

Phase I: Screening Ecological Risk Assessment

A Screening Ecological Risk Assessment (SERA) will be performed as the first step in the ERA process. During this work element available information, including data collected during Phase I of the RFI, will be evaluated utilizing an industry specific approach. This step will involve an extensive review of site-related data, characterization information, and ecological settings. An evaluation of SWMU specific pathways and potential receptors will be performed followed by an evaluation of media and receptor specific ESLs to complete the screening process. Data gaps, if any, will be identified.

A report describing the SERA will be submitted to USEPA for its review and approval. The report will contain the elements of an ecological risk assessment as discussed in the appropriate guidance documents. These elements are: 1) Problem Formulation; 2) Analysis (including characterization of exposure and characterization of ecological effects); and 3) Risk Characterization. An SMDP exists at this juncture and if the results of the SERA support a "no further action" decision, the ERA will be considered complete and no additional ecological assessment work will be required. However, if data gaps are identified or a "no further action" decision can not be supported, additional work in the form of a Preliminary Ecological Risk Assessment (PERA) will be performed.

The SERA report is expected to resolve the remaining ecological issues associated with the Phase I RFI activities and therefor allow the USEPA to approve the Draft Phase I RFI Report as the "Final Report". Once approval of the "Final Report" is received, Olin will begin preparation of the Draft Phase II RFI Work Plan (Work Plan). By approving the SERA report prior to preparation of the Work Plan, additional data requirements (if any) to support the risk management decisions made on the basis of the SERA, can be written into the Work Plan and submitted to USEPA for approval along with all other proposed Phase II RFI activities. If a PERA is required based on the results of the SERA, a detailed work plan describing the PERA will be provided as part of the Phase II RFI Work Plan. This approach will provide for efficient Work Plan preparation and provide USEPA a description of all proposed Phase II RFI activities in one document.

Phase II: Preliminary Ecological Risk Assessment

If the results of the SERA do not support a "no further action" decision, a PERA will be performed during Phase II of the RFI after data or other information necessary to complete the PERA have been collected during the Phase II RFI activities. Data collection and the PERA will be performed following USEPA approval of the aforementioned Work Plan. The PERA will follow similar methodology and contain the same elements as the SERA resulting in a further evaluation of potential ecological risk. The PERA will build on the results of the SERA by incorporating new site characterization information and site-specific receptor and exposure scenarios.

Results of the PERA, if performed, will be included in the Draft Phase II RFI Report. If these results support a "no further action" decision, the ERA process will be considered complete and no additional ecological assessment work will be required. If the results of the PERA indicate that unacceptable ecological risk exists, recommendations to address this risk will be provided in the Draft Phase II RFI Report.

Chapter 10

Ecological Assessment

Tables within Text

Figures, Tables, and Appendices following Text

Figure

Table

Appendix

10 ECOLOGICAL ASSESSMENT

This chapter presents the results of the baseline terrestrial ecology assessment conducted as part of Phase I at the MPF.

10.1 INTRODUCTION

The objective of the ecological assessment was to describe the terrestrial ecology within the boundaries of this industrial facility. This effort was undertaken as part of a RCRA Facility Investigation (RFI). If future investigations are required to address the extent to which hazardous waste or constituents present at the MPF could negatively impact ecological resources, it is necessary that basic knowledge regarding such resources be available. As the work on this RCRA Corrective Action proceeds, the information contained in this report will assist in the development of investigation plans that direct efforts in a meaningful and productive manner.

The organization of this chapter starts with a description of the methods employed, followed by the results of the assessment. This assessment included a review of background information regarding ecological resources of the region. A field assessment of the facility was then conducted during the first week in May 1995.

Due to the timing of the field investigation, some aspects of the assessment had to rely on published literature. For example, spring bird migration was in its peak during the first week in May, thus the bird data include not only species that nest on the MPF, but also migrants that were still moving through the area. In addition, weather conditions during the field survey were unusually cool; as a result, few snakes or lizards were active and observable. Because of such limitations, an important aspect of this assessment focused on existing habitat conditions and the likely wildlife communities with which they are normally associated.

10.2 METHODS

10.2.1 Plant Ecology

10.2.1.1 Background Information

Prior to the field survey, background information on the area was reviewed. This background information included the National Wetlands Inventory (NWI) map prepared by the United States Fish and Wildlife Service (Figure 10-1), the Madison County Soil Survey (Figure 10-2), and aerial photographs of the MPF.

A literature review was conducted of pertinent information related to Illinois Flora. This literature review included the *Flora of Illinois* (Jones, 1963), *Forest Atlas of the Midwest* (Merz, 1978), *Plant Communities of Southern Illinois* (Voigt and Mohlenbrock, 1964), and the *Forest Trees of Illinois* (Mohlenbrock, 1978b). In addition, the *Illustrated Flora of Illinois Series* (Mohlenbrock, 1970a, 1970b, 1973, 1978a, 1980, 1981, 1986, 1987) and *Missouri Wildflowers of the St. Louis Area* (Eisendrath, 1978) were used to determine plant distribution and habitat information. Information regarding endangered and threatened species was obtained from the *Endangered and Threatened Species of Illinois Status Volume 1 Plants* and *Volume 3 with 1994 Changes* (Herkert, 1991, 1994).

Two sets of aerial photographs of the MPF were obtained. These aerial photographs were taken by Walker & Associates, Inc. on April 10, 1991 and February 2, 1992, and were at a scale of 1 inch equals 400 feet.

10.2.1.2 Vegetation Cover Type Map

The April 10, 1991 aerial photographs were used as the base for the vegetation and land use map (Figure 10-3). A preliminary cover map was prepared prior to the site visit. During the field investigation (May 1 to 5, 1995), the cover type map was refined. Each portion of the MPF was assigned to a vegetation cover type based on the physical structure and the dominant plant species present. Land use categories were used to identify developed areas, such as the industrial and

agricultural portions of the MPF. Aerial photography was used to determine the cover types in the southwestern corner of the facility. The acreage of land use and vegetation cover types was determined from Figure 10-3 using a Design CAD 2-D Version 7.0 graphics package.

Plant communities dominated by trees greater than 20 feet in height and having diameters at breast height (dbh) greater than 5 inches were considered to be forests. Deciduous forests with standing water were designated as wet on the cover map (Figure 10-3). Shrub communities were dominated by shrub species and scattered trees less than 20 feet in height. Open field areas were defined as areas covered by herbaceous vegetation with few or no trees or shrubs present. Areas designated in Figure 10-3 and Table 10-1 as "wetlands" or "wet" were determined based on their role as wildlife habitat. These "wet" areas may, or may not, be considered jurisdictional wetlands by state or federal agencies. A detailed wetland delineation would be required to determine the jurisdictional status of these areas.

10.2.1.3 Field Assessment

Each cover type was assessed in the field to determine plant species composition, with dominant species recorded for the different layers of vegetation. Vegetation data were recorded on data sheets at representative locations within each cover type. Nomenclature for scientific names follows the *Manual of Vascular Plants of Northeastern United States and Adjacent Canada* (Gleason and Cronquist, 1991). Generally, common name usage follows the *Illustrated Flora of Illinois* series (Mohlenbrock, 1970a, 1970b, 1972, 1973, 1978a, 1980, 1981, 1986, 1987).

10.2.2 Wildlife Ecology

10.2.2.1 Background Information

The review of background information focused on determining which wildlife species have the potential to occur on the MPF, based on known geographical distribution. General field guides were used and included Conant and Collins (1991) and Johnson (1992) for reptiles and amphibians, Robbins *et al.*

(1983) and Peterson (1980) for birds, and Burt and Grossenheider (1976) and Schwartz and Schwartz (1981) for mammals. Range maps and habitat descriptions in these publications were used to determine which wildlife species might be present on the MPF and the habitat types in which they might be found.

In addition to the above sources of information, more specific data were available on birds. The Office of Migratory Bird Management of the U.S.D.I. Fish and Wildlife Service was contacted to obtain Breeding Bird Survey data for several locations in Illinois and Missouri near the MPF. These data are collected annually by experienced bird watchers according to strict guidelines regarding dates, times of day, weather conditions, and observation time. For some of the routes used in this study, data have been collected since at least 1966. These Breeding Bird Survey data were used to further refine the list of species with potential to be on the MPF.

Lastly, Christmas Bird Count data, published annually in *American Birds* were used to obtain information on winter bird occurrences. Christmas Bird Counts are conducted annually in a 7.5-mile radius around a specific location. Three such counts are located within approximately 25 miles of the MPF, and these data provided information on species expected to winter on or in the vicinity of the MPF.

10.2.2.2 Field Assessment

Wildlife data were collected by auditory and visual observations of individuals or their sign (for example, tracks, scat, burrows). All observations were recorded by the vegetation cover type in which they were found.

Amphibians (adults and larvae) were searched for in aquatic habitats by walking pond and stream edges and looking for adults, larvae and tadpoles, and egg masses. In terrestrial habitats, rocks, logs, debris, and other cover objects were turned over in an attempt to observe individuals using these types of cover. Frogs and toads were also surveyed in the late afternoon and early evening by listening for breeding choruses near water bodies or other wet areas.

Reptiles were searched for by overturning cover objects, visually scanning areas where they might be basking in the sun, and by intensive ground searches. Birds were surveyed visually and by song or other vocalization. Mammals, and their sign, were observed visually. Intensive ground searches for tracks, scat, burrows or other evidence of presence were performed.

10.2.2.3 Habitat Assessment

The objective of the habitat assessment was to determine the suitability of each vegetation cover type as habitat for those wildlife species expected to occur on the MPF. Habitat conditions suitable for feeding, nesting, and protective cover were considered to be key life requisites.

This assessment was based largely on the physical and structural features of each vegetation cover type. Physical features included soil type (for example, sandy or other), wetness (for example, dry, saturated, standing water, flowing water), slope and aspect, and the proximity and type of human presence/disturbance (for example, roads, buildings, fences and other structures).

The structural features of vegetation in each habitat type that were considered included: 1) the diversity and extent of vegetation strata; 2) the presence of tree cavities; 3) the presence of refugia for small mammals, reptiles, and amphibians (for example, fallen trees, decaying stumps, structures, debris); and 4) the availability of sunning locations (for example, fallen logs in ponds, unvegetated stream banks, and structures elevated above ground vegetation).

10.2.3 Threatened and Endangered Species

10.2.3.1 Background Information

Lists of threatened and endangered plant and wildlife species in Illinois were obtained from the Illinois Department of Conservation. These lists were reviewed in conjunction with published range maps to determine which species had the potential to occur on the MPF. Publications from the Illinois Endangered Species Protection Board (Herkert, 1991, 1992,

and 1994) provided details on the status of each listed species, the reasons for the species' status, former and present distribution (by county), habitat associations, and management recommendations. These publications provided the most up-to-date and specific information available on the distribution of threatened and endangered species in Illinois. Other botanical and wildlife literature sources were used for details on species identification, behavior, and habitat requirements.

10.2.3.2 Agency Contacts

The U.S.D.I. Fish and Wildlife Service and the Illinois Department of Conservation were contacted for any available information regarding threatened or endangered species known from the MPF or the immediate area. Copies of this correspondence can be found in Appendix 10-A.

10.2.3.3 Field Assessment

Endangered and threatened species were searched for in habitats appropriate to each species. This represented an important component of the overall field effort.

Because of the seasonal differences in flowering, fruiting, breeding, hatching, and dispersal of the various threatened and endangered species, there is a limit as to how comprehensive a 1-week field effort can be. Thus considerable effort was devoted to determining the suitability of the MPF as habitat for such species.

10.3 RESULTS

10.3.1 Plant Ecology

10.3.1.1 Background Information

The MPF is within 2 miles of the Mississippi River and is located in the Middle Mississippi Border Division, a glaciated section of Illinois. It is very close to the junction of the Lower Mississippi River Bottomlands Division northern section (Schwegman, 1973). Forests in this region are dominated by white oak and black oak on the dry sites. Mesic sites are

dominated by sugar maple, basswood, red oak, hackberry, slippery elm, and black walnut. Floodplain forests contain silver maple, hickories, cottonwood, and sycamore. Prairies are limited to steep slopes and ridges on deep loess atop the river bluffs (Schwegman, 1973). Most prairie habitats have been eliminated from this region of Illinois due to human disturbance.

The industrial portions of the MPF are generally flat and at elevations of approximately 434 to 440 feet above mean sea level (Figure 3-1). Industrial and agricultural portions of the MPF are within the floodplain of the East and West Forks of the Wood River and are protected by levees. Steep hillsides with elevations reaching over 500 feet above mean sea level border the East Fork of the Wood River. Intermittent drainageways channel water from these hillside into the East Fork of the Wood River. Bedrock geology in the vicinity of the MPF is composed of limestone and shale (Soil Conservation Service, 1986).

The NWI map shows both the East and West Forks of the Wood River as being a riverine system (Figure 10-1). Surrounding the rivers are areas mapped as palustrine forest wetland, which include areas that are temporarily flooded and seasonally flooded. Most of the bottomland forests within the facility appear on the NWI map as wetlands. Because NWI maps are prepared solely by means of aerial photo-interpretation, determining the extent of jurisdictional wetlands on the MPF would require a wetland delineation.

A diverse variety of soils have been mapped on the facility (Figure 10-2). Urban land and Orthents, loamy, undulating soils occur in the major manufacturing areas. Wakeland silt loam is the primary soil occurring in the floodplain bordering the East and West Forks of the Wood River. Fayette silt loam and Sylvan-Bold silt loams are the dominant soils on the hillsides in the southeastern and northwestern portions of the MPF.

10.3.1.2 Land Use and Vegetation Cover Type Descriptions

Following is a description of the land use and vegetation cover types on the MPF. The acreage of each cover type is presented, by zone, in Table 10-1. Dominant plant species are listed, by

cover type, in Table 10-2. Cover types include: open field, shrub, deciduous forest, deciduous forest wet, open water, wet meadow, emergent wetland, agriculture, levee, recreation, industrial, and excavated.

Open Field

The open field cover type occupies 225.4 acres, or 18.7 percent, of the MPF (Table 10-1). Various grass species dominate this cover type and most of these areas are mowed on a regular basis. Typical species found within this area include orchard grass (*Dactylis glomerata*), timothy grass (*Phleum pratense*), Kentucky bluegrass (*Poa pratensis*), red clover (*Trifolium pratense*), redtop grass (*Agrostis gigantea*), broom sedge (*Andropogon virginicus*), giant foxtail (*Setaria faberi*), and downy brome grass (*Bromus tectorum*). Other common species recorded in this cover type include dandelion (*Taraxacum officinale*), narrow-leaved plantain (*Plantago lanceolata*), and corn gromwell (*Lithospermum arvense*).

Shrub

Shrub areas cover only 15.0 acres (1.2 percent) of the MPF (Table 10-1). This cover type is dominated by early successional shrubs, which range from 4 to 18 feet in height. Early successional shrub species found in these areas include smooth sumac (*Rhus glabra*), gray dogwood (*Cornus foemina*), choke cherry (*Prunus virginiana*), and tartarian honeysuckle (*Lonicera tatarica*). Scattered, small trees such as box elder (*Acer negundo*) and black locust (*Robinia pseudoacacia*) are also found in these areas. Herbaceous vegetation includes common plantain (*Plantago major*), mullein (*Verbascum thapsus*), wild carrot (*Daucus carota*), ragweed (*Ambrosia artemisiifolia*), Kentucky bluegrass, timothy grass, and giant foxtail.

Deciduous Forest

Deciduous forests cover 464.0 acres (38.5 percent) of the MPF and include many diverse assemblages of tree species (Tables 10-1 and 10-2). Along the East and West Forks of the Wood River, are bottomland hardwood forests in which the trees range from 65 to 75 feet in height with diameters at breast height reaching 3 feet. These communities are dominated by

eastern cottonwood (*Populus deltoides*), silver maple (*Acer saccharinum*), sycamore (*Platanus occidentalis*), and black willow (*Salix nigra*). Understory trees, such as hackberry (*Celtis occidentalis*) and box elder, reached a height of 35 feet in this community. Shrub vegetation included spicebush (*Lindera benzoin*) and hawthorns (*Crataegus sp.*). Nodding wild rye (*Elymus canadensis*), jewelweed (*Impatiens capensis*), and scouring rush (*Equisetum hyemale*) were common species in the herbaceous layer. Poison ivy (*Toxicodendron radicans) and* riverbank grape (*Vitis riparia*) were prevalent as vines.

Hillside forests on steep slopes that border the East Fork of the Wood River are dominated by a mature oak-hickory forest. White oak (*Quercus alba*) is the dominant species in this community with numerous trees having diameters over 4 feet and heights over 70 feet. Red oak (*Quercus rubra*), shagbark hickory (*Carya ovata*), and black oak (*Quercus velutina*) were also present in this forest. Pawpaw (*Asimina triloba*), tartarian honeysuckle, and flowering dogwood (*Cornus florida*) were the dominant shrubs in the understory. Herbaceous vegetation included may apple (*Podophyllum peltandra*), green dragon (*Arisaema draconitum*), jack-in-the-pulpit (*Arisaema triphyllum*), spring beauty (*Claytonia virginica*), cut-leaved toothwort (*Cardamine concatenata*), and fragile fern (*Cystopteris fragilis*).

Deciduous Forest/Wet

This category was used to describe two forested areas, both of which contained from 1 to 3 feet of standing water during the May field visit. Combined, these two areas covered 30.7 acres, or 2.5 percent of the MPF (Table 10-1). Silver maple, pin oak (*Quercus palustris*), and green ash were the dominant trees in this community. The average height of the trees was 40 feet, with diameters ranging from 15 to 30 inches. Understory trees included box elder and American elm (*Ulmus americana*). Spicebush and pawpaw were found in the shrub layer. Herbaceous vegetation was sparse in the center of the flooded areas. Jewelweed, swamp buttercup (*Ranunculus hispidus*), sedges (*Carex sp.*), and water hemlock (*Sium suave*) were present on the perimeter of the flooded areas.

Open Water

The open water category covered 3.8 acres and includes two types of areas, the river system and open sloughs (Table 10-1). Exposed banks and sandbars were found along the river. Within these ephemeral areas, shrub sand bar willow (*Salix interior*) was found. Herbaceous vegetation included eastern cottonwood, giant foxtail, Virginia creeper (*Parthenocissus quinquefolia*), scouring rush, ragweed, and field horsetail (*Equisetum arvense*).

The small sloughs in Zone 2 were covered with a thick mat of duckweed (*Lemna sp.*). There was no rooted or floating aquatic vegetation in these ponds. One of the open water ponds within the industrial area contained common cattails (*Typha latifolia*).

Wet Meadow

Wet meadows cover a total of 14.1 acres (1.2 percent) of the MPF. Common species within these areas include stipate sedge (*Carex stipata*), reed canary grass (*Phalaris arundinacea*), and redtop grass. Approximately 6 to 12 inches of standing water was present within these areas.

Emergent Wetland

Emergent wetland covered 7.9 acres of the MPF and was dominated by common cattail, iris, wooly sedge (*Carex lasiocarpa*), and field horsetail (Tables 10-1 and 10-2). A portion of the emergent wetland area also included a stand of young willow (*Salix sp.*) trees.

Agriculture

This land use category, which covered 131.8 acres, was applied to those areas that were either plowed at the time of the May field investigation or which contained a crop. In some agriculture areas, winter wheat (*Triticum aestivum*) was established and averaged 2 feet in height. All other agricultural areas had been recently plowed.

Levee

This area occupied 62.2 acres, or 5.2 percent, of the MPF (Table 10-1), and was readily discernible on the aerial photographs as a broad band of open land. These areas were planted with a uniform mixture of plant species. Herbaceous vegetation included red clover, orchard grass, timothy grass, Kentucky bluegrass, and downy brome. Other grass species may be included in this mixture but were not evident at the time of the field investigation.

Recreation

Recreational uses of the MPF occupied 32.4 acres (Table 10-1). This land use category included the Center for Excellence, an employee clubhouse and picnic area, and employee trap, skeet, rifle, and pistol ranges. Vegetation in this land use type was dominated by mowed lawns. The picnic area contained a variety of trees that included several ornamental species such as sweet gum (*Liquidambar styraciflua*), tulip poplar (*Liriodendron tulipifera*), and pin oak. Herbaceous vegetation included Kentucky bluegrass, orchard grass, timothy, and red clover.

Industrial

This land use category included 217.5 acres (18.0 percent) of the MPF that are used for manufacturing (Table 10-1). Industrial uses include the brass mill, wad manufacturing, ammunition manufacturing, and a wastewater treatment plant. Ancillary structures and associated parking lots are included within this category. These areas were dominated by manufacturing buildings, with some portions containing mowed lawn and scattered ornamental trees and shrubs.

Excavated

A small 0.6-acre portion of the MPF was mapped as an excavated area (Figure 10-3). This area was devoid of vegetation during the field visit. It is expected that early successional species will colonize this area in the future.

10.3.1.3 Zones

The distribution of land use and vegetation cover types is presented, by zones, in Table 10-1. Although some zones are dominated by one or two cover types, most include substantial proportions of several types.

Zones 1, 3, 6, and 7 are largely industrial. The character of these industrial areas varied from Zones 1 and 7, which are mostly manufacturing buildings, to Zone 6 which included 22.7 acres of open field. All four of these zones included some deciduous forest, ranging from 0.7 acres in Zone 3 to 6.8 acres in Zone 6.

Zone 2 contained more cover types than any of the other zones. This zone included deciduous forest, deciduous forest/wet, excavated, industrial, levee, open field, open water, and shrub (Table 10-1). More than half (109.0 acres) of Zone 2 was occupied by deciduous forest. Zone 2 also contained some small but diverse areas of open field, including areas abandoned from industrial use, roadside areas, and storage buildings. One of two areas mapped as wet deciduous forest (18.1 acres) was found in Zone 2.

Five cover types were mapped in Zone 4 (Table 10-1). The three most prevalent types were deciduous forest, industrial, and levee. About half of the land mapped as levee on the MPF was found in Zone 4. The deciduous forest type mapped in Zone 4 included 58.6 acres of bottomland forest between the levees and the East Fork of the Wood River.

Slightly more than half of the deciduous forest mapped on the MPF was found in Zone 5. This included 247.8 acres of mature bottomland and oak-hickory forest. Zone 5, which is the largest of the nine zones, also included the greatest acreage of open fields (133.4 acres).

Zones 14 and 15 are similar in that some cover types were only found in these two zones. For instance, the two wet meadows that were mapped on the MPF were located in Zone 14 and Zone 15. Likewise, all land used for recreation was in these two zones, and the only emergent wetland designated on the MPF was found in Zone 15. Both zones also included considerable acreage mapped as agriculture. Zone 15 included

30.1 acres of deciduous forest and 12.6 acres of wet deciduous forest, while Zone 14 had only 4.1 acres of forest.

10.3.2 Wildlife Ecology

For the purpose of describing the wildlife ecology of the MPF, the mapped vegetation cover types were grouped into wildlife habitat types. This was done by combining those cover types whose vegetation composition and structure were similar enough to represent similar habitat conditions for certain groups of wildlife species. Therefore, the following wildlife habitat types, and the vegetation cover types included in each habitat type, were considered to be present on the MPF.

Table 10-A — Habitat Type at MPF

Abbreviation	Habitat Type
OF	Open Field (includes Open field, Levee, and Recreation)
SH	Shrub
DF	Deciduous Forest (includes Deciduous Forest and Deciduous Forest/Wet)
OW	Open Water
WM	Wet Meadow/Emergent Wetland
AG	Agriculture
IN	Industrial

10.3.2.1 Reptiles and Amphibians

A review of published range maps revealed the possibility that a fairly diverse amphibian and reptile community exists on the MPF. This is particularly true of snakes. With the diversity of habitats and the large size of the MPF, it is thus expected that a diverse herpetofaunal (i.e., amphibians and reptiles) community exists.

Table 10-3 is a list of the amphibians and reptiles observed on the MPF. Weather conditions during the field survey were generally not conducive to observing amphibians and reptiles. The weather was basically cold and cloudy, or raining. This severely limits some types of activity, such as the basking behavior of reptiles.

Species Observed

The observed mole salamander larvae were probably small-mouthed salamanders (*Ambystoma texanum*) based on color, time of year, and size. Mole salamanders are a group of fossorial salamanders that are difficult to locate other than during the breeding season.

Numerous dwarf American toad larvae were observed in one small wet area in Zone 2. The fact that no adults or subadults were observed is probably indicative of a small population of this species, since toad activity is generally not hampered by cool, rainy weather.

Blanchard's cricket frogs were heard calling in one location in a small slough in Zone 2. Western chorus frogs were heard calling in numerous deciduous forest areas that had standing water. This was the most abundant frog recorded on the MPF. Wood frog tadpoles were observed in one location in a small wet area in Zone 2.

Eastern box turtles were widely distributed in the forested areas on the MPF. Individuals were observed in the floodplain forest along the East Fork of the Wood River, the extensive wooded ravines in Zone 5, the forested areas in Zone 2 and in a planted agricultural field in Zone 5. The fact that a fairly large number of individuals was observed incidental to other field work is indicative of good habitat conditions.

Numerous midland painted turtles were observed basking on logs in two open water sloughs in Zone 2. Individuals of all sizes were observed, indicating continued reproductive success. Lastly, one blue racer (approximately 3 1/2 feet long) was observed amongst some concrete rubble in a shrub area in Zone 2.

Habitat Assessment

Open Field — The large open field areas on the MPF, especially in Zone 5, provide potential habitat for several species of snakes, particularly those that feed largely on small mammals. Among these species could be the prairie kingsnake (*Lampropeltis calligaster*) and speckled kingsnake (*Lampropeltis getula*). These areas may offer not only

foraging habitat, but areas in which to bask since the open fields are interspersed with small roads and buildings.

Shrub — The shrub habitat on the MPF, while limited in size, could provide important habitat for a variety of herpetofauna because of its structural diversity, proximity to open water sloughs, and the cover provided by the various buildings and foundations that occur in this cover type. Eastern garter snakes (*Thamnophis sirtalis*) and eastern hognose snakes (*Heterodon platirhinos*) could use this area, the latter particularly if the soils were sandy and there were toads (a major food source) in the area.

Deciduous Forest — The deciduous forest is one of the most important habitats on the MPF for amphibians and reptiles. Wet forested areas are heavily used by western chorus frogs for breeding, and also by dwarf American toads and wood frogs. As these areas lose standing water, but remain moist later in the summer, they could provide foraging habitat for these same species. Cavity-nesting birds, such as chickadees, are often prey to black rat snakes (*Elaphe obsoleta*) in deciduous forests. These snakes are highly arboreal and take advantage of the seasonal availability of nestlings in spring and early summer.

The deciduous forests on the MPF also provide substantial refugia in the form of fallen trees. These could provide cover and nesting locations for lizards such as the five-line skink (*Eumeces fasciatus*) and the northern fence lizard (*Sceloporus undulatus*). Moist substrates and adequate refugia such as found in this cover type also provide suitable habitat for northern redbelly snakes (*Storeria o. occipitomaculata*) and northern ringneck snakes (*Diadophis punctatus edwardsii*). These last two species feed on insects, earthworms, and other invertebrates, all of which are abundant in the soil and leaf litter of deciduous forests.

Open Water — Open water areas are limited, but are important, especially to frogs. Many of the potentially occurring species use quiet, permanent water bodies that lack fish. The sloughs in Zone 2 appear to be suitable for these reasons and may provide necessary breeding habitat for green frogs (*Rana clamitans*), southern leopard frogs (*Rana u. utricularia*), and pickerel frogs (*Rana palustris*). These open water areas are also important feeding and basking areas for

midland painted turtles. Their suitability is enhanced by openings in nearby upland areas with sandy soils in which turtles can nest. The proximity of open water to suitable upland habitat types is an important factor in the overall habitat suitability of portions of the MPF.

The two branches of the Wood River may be particularly important to softshell turtles (*Apalone sp.*). These turtles feed on fish and aquatic invertebrates and inhabit flowing waters with sandy banks and substrate in which to burrow. The East Fork of the Wood River appears to be particularly suitable for this reason.

Wet Meadow/Emergent Wetland — While limited in extent on the MPF, these two cover types may provide important habitat for frogs, such as spring peepers, that breed in temporary water. These cover types, along with some other wet areas, such as along the Wood River, are habitat for crayfish. Numerous crayfish chimneys were observed in these locations. Graham's crayfish snake (*Regina grahamii*) feeds almost exclusively on soft-bodied crayfish and uses their burrows as cover. If these snakes are present on the MPF, they would be restricted to these cover types.

Agriculture and Industrial — Because of the highly disturbed nature of these two cover types, they are of limited usefulness to herpetofauna. Ground cover is limited, and substrate conditions in the industrial areas are generally unsuitable for feeding or burrowing. The species most likely to use these areas might be the Fowler's toad (*Bufo woodhousei*), eastern box turtle, or midland brown snake (*Storeria dekayi wrightorum*).

Zones

Zones 1, 3, 6 and 7 are largely industrial areas with very limited potential to provide habitat for amphibians and reptiles. Zone 4 is also largely industrial and agricultural, but has a fairly large area of deciduous forest bordering the East Fork of the Wood River. This relatively undisturbed area provides additional habitat for herpetofauna.

Zones 14 and 15 exhibit a high degree of habitat interspersion among the more natural habitats (deciduous forest, emergent

wetland) and those manipulated by human activities, such as the agriculture cover type and the recreation cover type. Zone 2, with its interspersion of deciduous forest (including some areas with standing water), shrub community, levee, and open water, offers an array of habitat types in proximity to each other. These areas constitute suitable breeding, sunning, feeding, and hibernating locations for a variety of amphibian and reptile species.

Lastly, Zone 5 offers the largest blocks of deciduous forest and open field habitats on the MPF, both of which can provide good habitat for herpetofauna. The undisturbed wooded hillsides and ravines probably support the more terrestrial amphibians and reptiles, such as the Eastern box turtle and a number of lizard and snake species. The large block of open field is good habitat for reptiles, especially snakes that are adapted to prairie-like conditions. These open fields provide sunning and nesting locations, and probably support a variety of small mammals, the major food source for many snakes.

10.3.2.2 Birds

Background information on birds was reviewed prior to performing the field survey. Key sources of information included *The Birds of Illinois* (Bohlen, 1989), Breeding Bird Survey data from the U.S. Fish and Wildlife Service, and Christmas Bird Count data published in *American Birds* (Drennan, 1990, 1991, 1992). Bohlen (1989) and the Breeding Bird Survey data aided in interpreting observations recorded during the May 1995 field survey.

Species Observed

Table 10-4 lists the species observed on the MPF from May 1 to 5, 1995. Indicated on the table are the habitats in which each species was observed, although many of the species could use habitats other than the ones noted.

A "status" indication is also given for each species. "PB" indicates species that are probable breeders on the MPF. This determination was based on whether or not the species is a known breeder in the vicinity of the MPF (from Breeding Bird Survey routes in the area), information in Bohlen (1989), and whether or not there is suitable breeding habitat on the MPF.

An "M" indicates species that are either strictly migrants (that is, breeds farther north), or species that may breed in the area but for which no suitable habitat exists on the MPF.

Eighty-three species were observed on the MPF, of which 18 were migrants, primarily warblers that breed farther north. A number of other species, including probable breeders, that would be expected on the MPF may be later migrants.

Habitat Assessment

Open Water, Wet Meadow, and Emergent Wetland — The open water, wet meadow, and emergent wetland habitats yielded the smallest number of bird species. This is primarily due to the limited extent of these habitats on the MPF, the low structural diversity of the vegetation, and possibly because other migrant species that use wet meadow habitat had not yet arrived when the field survey was performed.

Open water areas are especially important to waterfowl, such as mallards and wood ducks. Kingfishers and great blue herons also use open water areas in which to feed. Wet meadows and emergent wetlands are particularly important as nesting locations for red-winged blackbirds and were observed to be used as foraging areas by several species of swallows. Post-breeding dispersal of several heron species may result in these areas being used more extensively for foraging later in the summer.

Agriculture — Many agricultural areas were freshly plowed prior to the field survey and others were planted with a grain crop. Unvegetated agricultural areas are a source of grit and invertebrates (worms) for several ground-feeding species including the American crow, killdeer, American robin, European starling, meadowlark, and common grackle. Red-winged blackbirds may use the grain crops as nesting habitat and feeding habitat. Agricultural areas are generally not suitable habitat for most avian species because they are monocultures. They will be used by birds primarily if the crop represents a food source.

Industrial — The industrial areas contain not only buildings and other structures, but also areas of lawns, ornamental shrubs, and trees which can provide habitat for several species

not necessarily associated with artificial structures. For example, American kestrels, mourning doves, American robins, northern mockingbirds, meadowlarks, and common grackles feed on the ground in grassy areas. Killdeer will nest in gravel or paved areas in parking lots or around buildings, whereas rock doves, chimney swifts, eastern phoebes, European starlings, house finches, and house sparrows find buildings and other structures to be suitable nesting or roosting habitat.

Open Field — The open field and shrub habitats on the MPF had approximately the same number of bird species present, although the species varied somewhat. Some of the open field habitat in Zone 5 and the recreation areas in Zones 14 and 15 includes scattered trees and shrubs. For this reason, some of the bird species observed in the open field habitat (such as several woodpecker species, blue jays, several warbler species, and northern orioles) are not normally associated with open fields. Open fields are important feeding habitat for red-tailed hawks and American kestrels. These species feed on small rodents which inhabit grassland areas. Open field areas are also heavily used by swallows as feeding areas, and by several sparrow and blackbird species as nesting habitat.

Shrub — The shrub habitat on the MPF, although limited in extent, provides habitat for many of the same species found in the deciduous forest, as well as some that are specifically associated with shrub communities. Among the latter species are the gray catbird, northern mockingbird, blue-winged warbler, yellow warbler, northern cardinal, and yellow-breasted chat. For these species, the shrub community provides not only nesting habitat, but also important feeding habitat.

Deciduous Forest — Lastly, the deciduous forest habitat supported more than twice as many species as any other habitat. Many of these species use deciduous forests specifically as nesting habitat. Among these are cavity nesters such as the barred owl, the six woodpecker species, chickadees, prothonotary warbler, and tufted titmouse (Harrison, 1975). Other species, such as the northern oriole and cerulean warbler, build their nests high in deciduous trees. Some species, such as the white-breasted nuthatch and the woodpeckers, forage specifically on tree trunks in forested areas and many of the other species observed (primarily warblers) feed on insects in

the canopy of deciduous forests. The fact that the deciduous forests on the MPF are mature and characterized by good structural diversity makes them especially suitable to a diverse avifaunal community.

The presence of water (in sloughs, streams, and the Wood River) in or adjacent to much of the deciduous forests increases the wildlife habitat value of these forests. The proximity of open water to forests offers habitat to species that feed in or along the edges of water bodies, but for which other life requisites, such as nest sites or cover, are provided by mature forests.

Zones

Differences in avifaunal use among the various zones are due primarily to the presence and proportion of the various vegetation cover types. The structure and interspersion of cover types in any one zone greatly influences which birds use that zone. Zones that are largely industrial, such as Zones 1, 3, and 7, and a large portion of Zone 4, provide habitat for European starlings, rock doves, and house sparrows, species that adapt well to human structures and activities. These three species all feed on the ground and nest in buildings and other structures.

Zones 5 and 2 have the largest blocks of mature deciduous forest. The multi-layered structure of these forests provides diverse habitat conditions for a large variety of bird species, including those that forage or nest in the forest canopy, understory, ground layer, or in trees themselves. While the deciduous forest in Zone 2 is somewhat disjunct due to the interspersion of buildings in this area, the large size of some trees indicates that disturbance was limited to areas immediately adjacent to the structures.

The mature deciduous forest in Zone 5 is also characterized by excellent structural diversity and an abundance of natural cavities for nesting. This area also has substantial topographic relief in the form of ravines. These ravines add another dimension to the structural diversity of this forest and provide suitable habitat for species, such as the Louisiana waterthrush, that are associated with wooded ravines and small streams.

Winter Birds

Table 10-5 is a list of birds reported in the vicinity of the MPF during the winter. This list was complied from 3 years of Christmas Bird Count data from three locations in the vicinity of the MPF. A total of 110 species was reported from these counts, many of which would not be expected to winter on the MPF due to a lack of suitable habitat. Nevertheless, because of the size of the MPF, and the diversity of habitats present, almost half of these species are likely to use the MPF in winter.

The pattern of winter bird use of the various habitats and zones on the MPF probably parallels bird use in spring migration and summer, although the species will vary somewhat (Table 10-5). Some species found on the MPF are permanent residents and will continue to use much the same habitats in winter as they use in summer. Among these species are the northern bobwhite, barred owl, and most of the woodpeckers.

Open fields can provide winter feeding habitat for red-tailed hawks, rough-legged hawks, and American kestrels, all of which feed on small mammals.

In winter, shrub habitats can provide foraging areas for American tree sparrows, dark-eyed juncos, northern cardinals, and cedar waxwings. Shrub species that bear fruit or berries that persist into winter will make these areas even more valuable as habitat.

Deciduous forests will provide winter habitat for nuthatches and woodpeckers. Woodland hawks, such as the sharp-shinned hawk and Cooper's hawk, two hawks that feed largely on birds, will use these areas for roosting and feeding.

The wet meadow/emergent wetland habitat may be used in winter by red-winged blackbirds and rusty blackbirds, in addition to common grackles and song sparrows.

Agricultural fields can serve as winter feeding habitat for several species, such as Lapland longspurs and horned larks, species that require open areas with little or no vegetation.

The industrial areas on the MPF will continue to be used in winter by many of the same species that were observed in May.

These species include the rock dove, house sparrow, house finch, and European starling.

10.3.2.3 Mammals

The review of literature regarding mammals focused on the geographic ranges and habitat requirements of species that could occur on or near the MPF. The potential for occurrence was based on range maps presented in Burt and Grossenheider (1976), Hamilton and Whitaker (1979), and Schwartz and Schwartz (1981). Information regarding habitat requirements was obtained primarily from Schwartz and Schwartz (1981).

East Alton is located in an ecological transition zone between forested communities in the Ozark highlands to the south and east, and prairie communities to the north and west. From a somewhat broader perspective, the central location of this region also represents a transition between northern and southern species as well as a transition between eastern and western species. Because of the transitional nature of this region, East Alton is located near the edge of many species' geographic ranges.

The abundance level of a species typically becomes low as one approaches the edge of its range; thus the likelihood of that species occurring in such a location is generally quite remote. It should be noted, however, that published range maps are often based on a limited amount of data and may greatly overestimate or underestimate the extent of a species' distribution. For the sake of characterizing the mammalian community inhabiting the MPF, it was assumed that such "edge of range" species either do not occur, or if they do it would be in such low numbers as to limit their role in the ecological dynamics of the MPF.

Fourteen mammalian species whose ranges end near the MPF were identified from the literature. These species are presumed to not occur on the MPF. They are listed here to document that they were considered.

Table 10-B — Species Presumed to Not Occur at the MPF

Species
Masked shrew (*Sorex cinereus*)
Swamp rabbit (*Sylvilagus aquaticus*)
Thirteen-lined ground squirrel (*Spermophilus tridecemlineatus*)
Franklin's ground squirrel (*Spermophilus franklinii*)
Plains pocket gopher (*Geomys bursarius*)
Marsh rice rat (*Oryzomys palustris*)
Western harvest mouse (*Reithrodontomys megalotis*)
Cotton mouse (*Peromyscus gossypinus*)
Golden mouse (*Ochrotomys nuttali*)
Hispid cotton rat (*Sigmodon hispidus*)
Eastern wood rat (*Neotoma floridana*)
Meadow vole (*Microtus pennsylvanicus*)
Badger (*Taxidea taxus*)
Eastern spotted skunk (*Spilogale putorius*)

Species Observed

Ten mammalian species were recorded during the field investigation. These species and the habitat types in which they were noted are presented in Table 10-6. All 10 species can be considered to be fairly common in this area (Schwartz and Schwartz 1981). The unidentified vole was a nest of young found in a wet meadow adjacent to an upland open field and was presumed to be a prairie vole (*Microtus ochrogaster*).

One interesting aspect of the facility is the abundance of white-tailed deer (*Odocoileus virginianus*). Although deer sightings or tracks were noted throughout the non-industrial portion of the MPF, the highest deer concentrations were observed within the fenced portion of Zones 2, 4, and 5. Deer were noted frequently in these areas and as many as 14 were seen at one time.

The deer herd inside the fenced portion of the facility may be considered to be a confined population. No openings large enough to allow a deer to crawl under the fence were observed. Crawling under such a fence represents the preferred means whereby a deer would attempt to circumvent such an obstacle. In a few locations, the height of the fence is as low as 5 to 6 feet, and despite barbed wire topping the fence, it is conceivable that some deer may jump over the fence in these areas. It is quite likely, however, that there is no appreciable

movement of deer in or out of the fenced portion of the facility. This may be due, in part, to the availability of suitable habitat within the fenced portion of the MPF and the highly urbanized conditions surrounding much of the MPF.

Habitat Assessment

For discussion purposes, the assessment of habitat suitability as it pertains to mammals is based on the mapped vegetation cover types (Figure 10-3). The suitability of each habitat type is described below.

Open Field, Levee, Recreation, Wet Meadow, and Emergent Wetland — These open habitat types are discussed together because of the structural similarity in the vegetation found in these areas. The dominant characteristic of these areas is the presence of dense herbaceous vegetation. Most of the open fields on the MPF are maintained by periodic mowing, thus there are few, if any, shrubs present. Use of these habitats is thus limited to those mammals that favor herbaceous vegetation and do not require any woody plant species.

The primary use of open habitats by mammals is probably restricted to white-tailed deer and a few species of small mammals. As noted previously, white-tailed deer were noted foraging extensively on the herbaceous vegetation present in these habitat types. It is assumed, based on range maps and habitat requirements, that the dominant small mammals occurring in these habitat types are the prairie vole, the deer mouse (*Peromyscus maniculatus*), the least shrew (*Cryptotis parva*) and possibly the short-tailed shrew (*Blarina brevicauda*).

Shrub and Deciduous Forest — Shrubs and deciduous forests are considered together because both are dominated by woody vegetation and, in many cases, both include a dense ground layer of herbaceous vegetation. There is considerable variability in the habitat structure of these forested and shrub areas. These areas represent good habitat for mammals because they contain not only excellent ground cover (both in terms of herbaceous vegetation, and refugia such as logs and brush piles), but also an abundant and wide assortment of cavities. Several mammalian species, especially squirrels,

require cavities in either dead or living trees for optimal habitat conditions.

Large- and medium-sized mammals noted in these habitat types include the white-tailed deer, raccoon, coyote, gray fox, and fox squirrel. White-footed mice (*Peromyscus leucopus*) and short-tailed shrews are probably the most common small mammals inhabiting these portions of the MPF. The abundance of large- and medium-sized snags, and their associated cavities, offer excellent habitat for raccoons, fox squirrels, and white-footed mice. Although none were observed during the field investigation, it is also possible that southern flying squirrels (*Glaucomys volans*) and eastern gray squirrels (*Sciurus carolinensis*) may occur in forested portions of the MPF.

Open water habitat on the MPF is limited primarily to the Wood River and a few sloughs. The only water-dependent mammal documented on the MPF was the beaver, which was found to be using a small area of open water in Zone 4. No muskrat sign was noted anywhere on the MPF. This may be due to the fact that: 1) the Wood River is obviously subject to large and routine fluctuations in water levels (as evidenced by the presence of levees), and 2) other on-site water bodies lack an abundance of prime muskrat food items, such as cattails.

Agriculture — Agricultural crops were not present in many fields during the investigation conducted in May. It is assumed that the primary use of agricultural land is limited to foraging by white-tailed deer. Certain small mammals can also be expected to inhabit cultivated areas during the summer and fall months.

Industrial — The industrial portions of the MPF represent limited habitat for mammals. It is possible that a few native species, such as the fox squirrel, find suitable habitat in certain portions of the industrial area. There was also some evidence of incidental use by white-tailed deer in some industrial areas. But for the most part, these areas can only be considered as suitable habitat for introduced species, such as the house mouse (*Mus musculus*) and Norway rat (*Rattus norvegicus*).

Zones

There are major differences among the various zones on the MPF in terms of habitat suitability for mammals. Zones 1, 3, 6, and 7 are dominated by industrial activity and as such offer little in terms of habitat value for mammals.

Zone 2 contains a good mixture of habitat types, especially young deciduous forest and some shrub habitat. White-tailed deer were found to be abundant in Zone 2, and both the gray fox and coyote were documented in this area.

The habitat suitability of Zone 4 is highly variable with industrial, agriculture, open field, and deciduous forest habitat types being most common. Deer were found to be common in Zone 4, especially within the fenced portion of this zone.

Zone 5 probably contains the greatest number of deer on the MPF. The southeastern portion of Zone 5, outside of the fenced area, also includes the largest stand of mature forest on the MPF. The presence of numerous large snags and the excellent structural diversity of the forest suggest that this portion of the MPF is suitable habitat for mammals that occupy forested habitats.

The habitats present in Zone 14 are limited primarily to open fields and small stands of deciduous forest, wet meadow, and emergent wetland. The picnic area located in the northern portion of Zone 14 represents good habitat for fox squirrels; several fox squirrels were observed in this area.

The habitat suitability of Zone 15 is likewise quite variable. Deer were observed in this area, but not to the extent found inside fenced portions of the MPF. Zone 15, as is the case with Zone 5, includes large areas of mowed open fields and as such represents good habitat for those small mammals, such as the prairie vole, that require such areas.

10.3.3 Threatened and Endangered Species

10.3.3.1 Plants

Contact was made with the Illinois Department of Conservation Endangered Species Protection Program and the United States Fish and Wildlife Service to determine if they

had any records of threatened or endangered plant species from the area near the MPF. The Illinois Department of Conservation reported that there were "no known occurrences of these resources with(in) the vicinity of the project area". The Fish and Wildlife Service reported three species that "have ranges that include the concerned area". Correspondence from these agencies are included in Appendix 10-A.

Table 10-7 is a list of rare plant species that could occur in the area. This list was based on distribution information regarding Illinois threatened and endangered species (Herkert, 1991, 1994), as well as the Fish and Wildlife Service response letter.

Many of the threatened or endangered plants known to occur in Madison County were known from prairie habitats. Through initial aerial photo-interpretation and subsequent ground searches, no prairie habitat was located on the MPF. Prairie habitats that are known to harbor rare plant species range from dry-mesic prairies to wet prairies. No such prairie habitats occur on the MPF. As a result, the following species, which are known from Madison County, are not expected to occur on the MPF: Hill's thistle (*Cirsium hillii*), whitlow grass (*Draba cuneifolia*), hairy beadgrass (*Paspalum bushii*), prairie white fringed orchid (*Platatanthera leucophaea*), sour dock (*Rumex hastalatus*), royal catch fly (*Silene regia*), and spring ladies' tresses (*Spiranthes vernalis*).

Three plants known from Madison County do, however, have the potential to occur on the MPF based on their habitat requirements (Table 10-7). These species are the large ground plum (*Astragalus crassicarpus var. trichocalyx),* decurrent false aster *(Boltonia decurrens),* and prairie spiderwort (*Tradescantia bracteata).*

Large Ground Plum

Large ground plum, a species listed as endangered in Illinois, is known to occur in a variety of habitat types. Two of its preferred habitats, open woods and glades, occur on the MPF. Appropriate on-site habitat is found within Zone 4 and is represented by the mature deciduous forest located on the hillside above the East Fork of the Wood River. However, this species was not located during the May field survey.

Decurrent False Aster

Decurrent false aster is considered to be a threatened species by both the U.S. Fish and Wildlife Service and the Illinois Department of Conservation. It is known from open areas on floodplains. This species was reported from Horseshoe Lake in Madison County after the flood of 1993. This species could occur on levees, agricultural areas, and other open areas that were flooded during 1993 (Smith, pers. comm.). There is, therefore, some potential for this species to occur in any open areas on the MPF that were flooded during 1993. It would not, however, be expected to occur in the shaded bottomland forests that border much of the East and West Forks of the Wood River. This species flowers in September and October, and would therefore not have been readily identifiable during the May field investigation. Confirmation of the presence or absence of this species would require a field investigation later in the growing season.

Prairie Spiderwort

Prairie spiderwort, a state endangered species, occurs in both dry prairies and disturbed habitats, such as railroad and highway rights-of-way. While there is no prairie habitat available on the MPF, there are disturbed areas such as railroad and highway rights-of-way, which could possibly represent suitable habitat for this species. However, vegetation on the rights-of-way on the facility appeared to be controlled by mowing or chemical methods. It is thus unlikely that suitable habitat exists for this species. A search of appropriate habitat during the field investigation failed to located this species.

10.3.3.2 Wildlife

Threatened and endangered wildlife species with the potential to occur on the MPF were initially investigated by contacting the U.S.D.I. Fish and Wildlife Service and the Illinois Department of Conservation. The responses received from these agencies can be found in an Appendix 10-A.

Secondly, publications from the Illinois Endangered Species Protection Board (Herkert, 1992 and 1994) were reviewed to determine which of the listed species are known from Madison County. The habitat requirements of species known from Madison County were then reviewed and compared to habitat

conditions on the MPF as a means of determining the potential for any listed species to be present.

The following are federally-listed wildlife species whose geographic ranges include the vicinity of the MPF.

Table 10-C — Federally Listed Wildlife Species in Vicinity of MPF

Species	Status	Comment
Bald eagle *Haliaeetus leucocephalus*	Federally Threatened State Endangered	No habitat on the MPF
Least tern *Sterna antillarum*	Federally Endangered State Endangered	No habitat on the MPF
Gray bat *Myotis grisescens*	Federally Endangered State Endangered	No habitat on the MPF
Indiana bat *Myotis sodalis*	Federally Endangered State Endangered	Potential foraging habitat along wooded streams and in deciduous forests
Illinois chorus frog *Pseudacris streckeri illinoensis*	Fed. Candidate (C2) State Threatened	No habitat on the MPF

The following are additional state-listed threatened or endangered wildlife species with former or recent records in Madison County.

Table 10-D — State-Listed Species in Madison County

Species	Status	Comment
Eastern massasauga *Sistrurus catenatus*	State Endangered	No habitat on the MPF
Upland sandpiper *Bartramia longicauda*	State Endangered	Potential habitat in open fields
Little blue heron *Egretta caerulea*	State Endangered	No habitat on the MPF
Snowy egret *Egretta thula*	State Endangered	No habitat on the MPF

Table 10-D — State-Listed Species in Madison County (continued)

Species	Status	Comment
Black-crowned night-heron *Nycticorax nycticorax*	State Endangered	Potential habitat in bottomland forests
Bewick's wren *Thryomanes bewickii*	State Endangered	Potential habitat in shrub areas and hedgerows
Yellow-headed blackbird *Xanthocephalus xanthocephalus*	State Endangered	Limited potential habitat in emergent wetlands.
Timber rattlesnake *Crotalus horridus*	State Threatened	No habitat on the MPF
Great Plains ratsnake *Elaphe guttata emoryi*	State Threatened	No habitat on the MPF
King rail *Rallus elegans*	State Threatened	No habitat on the MPF
Great egret *Casmerodius alba*	State Threatened	Potential habitat in flood-plain forests
Common moorhen *Gallinula chloropus*	State Threatened	No habitat on the MPF
Pied-billed grebe *Podilymbus podiceps*	State Threatened	No habitat on the MPF

None of the threatened or endangered species on either the federal or state lists were observed on the MPF. However, for several of the listed species, potential habitat exists on the MPF. These species are discussed below.

Indiana Bat

This federally and state endangered species winters in caves or mines, but summers in wooded areas. Females have young in hollow trees or beneath the bark of trees (Schwartz and Schwartz, 1981). Both sexes forage in forested areas among trees along streams or in river floodplains. They also use forests on hillsides or ridges. While there are no known caves for wintering bats on the MPF, forested areas along both forks of the Wood River (especially the East Fork between Zones 4 and 5) are potential summer habitat for this species. The

wooded ravines and streams corridors in the southern portion of Zone 5 also represent potential habitat.

Upland Sandpiper

This state-listed endangered species nests in open fields, pastures, hayfields, fallow fields, grain fields, and red clover fields (Bohlen, 1989). This species has not been recorded in Madison County since 1980 (Herkert, 1994). The large open fields of Zones 4 and 5 are potential habitat for this species. None were present, however, during the field investigation in May. The timing of the field survey is well into their migration and this is a very conspicuous and easily observable species; therefore, the conclusion must be drawn that they do not nest on the MPF.

Black-crowned Night-heron and Great Egret

Both of these species are colonial nesters, often in mixed colonies that include both species as well as great blue herons. Nesting habitat is described as bottomland forest, with willow or cottonwood thickets occasionally used (Herkert, 1994). Bohlen (1989) reported that in 1987 the largest colony of black-crowned night-herons (659 nests) in Illinois was in Madison County. Both species arrive in the state in April, and both species are conspicuous if present. Therefore, while there may be some suitable habitat on the MPF, breeding by these species is unlikely.

Bewick's Wren

The Bewick's wren prefers habitats such as thickets, brushy areas, and hedgerows (Herkert, 1994). This species is a cavity-nester that often uses artificial structures such as farm equipment and outbuildings (Bohlen, 1989). A migrant, this species arrives early in spring and would have been present during the field survey. While there is some apparently suitable habitat on the MPF, it is unlikely that this species is present. Herkert (1994) identified competition from house wrens, house sparrows, and European starlings as a possible reason for this species' decline. Since all three of these cavity-nesting species were common to abundant on the MPF, the probability that Bewick's wrens breed on the MPF is low.

Yellow-headed Blackbird

This species reaches the edge of its range in Illinois. It nests in dense stands of cattails and bulrushes interspersed with open water areas (Herkert, 1994). Bohlen (1989) reports breeding in the west-central portion of the state "fortuitous and intermittent", and the species is on the list because of localized breeding. The emergent wetland area in Zone 14 is the only area on the MPF that represents suitable breeding habitat for this species, and this area is fairly small. Because this species arrives in Illinois in late March or April, the timing of the field survey would have coincided with the species presence. Therefore, while there is a limited amount of habitat on the MPF, the presence of yellow-headed blackbirds as a breeding species is unlikely.

10.4 Ecological Assessment Findings

The baseline ecological assessment performed during Phase I included evaluations of the plant and animal ecology of the MPF and whether endangered species are using the property. Findings for each of these are presented in this section.

10.4.1 Plant Ecology

Twelve land use or vegetation cover types were mapped on the MPF. The four most common cover types were deciduous forest (38.5 percent of the MPF), open field (18.7 percent of the MPF), industrial (18.0 percent of the MPF), and agriculture (10.9 percent of the MPF). The remainder of the MPF was mapped as wet deciduous forest, emergent wetland, excavated, levee, open water, recreation, shrub, and wet meadow.

The list of dominant plant species included 128 species. This total included 28 tree species, 16 shrub species, 7 fern species, and 77 herbaceous species.

10.4.2 Wildlife Ecology

The non-industrial portions of the MPF were found to be inhabited by a diverse faunal community. Various habitat conditions were found on

the MPF and, for the most, part offer suitable habitat for many common wildlife species.

Reptiles and Amphibians — Five amphibian species (small-mouthed salamander, dwarf American toad, Blanchard's cricket frog, Western chorus frog, and wood frog) and three reptile species (Eastern box turtle, midland painted turtle, and blue racer) were documented on the MPF. Numerous dwarf American toad larvae were observed in one small wet area in Zone 2: Blanchard's cricket frogs were heard calling in one location in a small slough in Zone 2; and Western chorus frogs were heard calling in numerous wet deciduous forests. Eastern box turtles were widely distributed throughout the forested portions of the MPF. One blue racer was observed among some concrete rubble in Zone 2.

The habitat assessment revealed that the large open fields on the MPF represent potential habitat for snakes, particularly those that feed on small mammals. Shrub habitat, while limited in size, was found to represent potential for a variety of amphibians and reptiles because of its structural diversity and proximity to open water sloughs. Wet deciduous forests were used for breeding by western chorus frogs, dwarf American toads, and wood frogs. The deciduous forests also contained substantial refugia for amphibians and reptiles. Open water, wet meadows, and emergent wetlands are limited in extent, but were found to be potential habitat for several frog species. Because of the highly disturbed nature of the agriculture and industrial areas, they lack the habitat conditions needed for most amphibians and reptiles.

Birds — Eighty three bird species were observed on the MPF, of which 18 were migrants that breed farther north. The number of bird species observed in the major vegetation cover types was as follows:

- open field - 31;
- shrub - 30;
- deciduous forest - 64
- open water - 7
- wet meadow/emergent wetland - 7
- agriculture - 9; and
- industrial - 17.

The presence of Top level predators + conservative species are indicators of No Effects,

The assessment of habitat conditions revealed notable differences among the vegetation cover types found on the MPF. The open water, wet meadow, and emergent wetland habitats were characterized by low structural diversity of vegetation. These areas were found to be suitable habitat for a few avian species.

Open field areas were found to be heavily used by swallows as feeding areas, and by several sparrow and blackbird species. Some of the open field habitat was found to include scattered trees and shrubs. For this reason, some of the birds observed in the open fields are species not normally associated with open fields. The shrub habitat on the MPF was found to be suitable for many of the same species found in the deciduous forests, as well as some that are specially associated with shrub communities.

The deciduous forest habitat supported more than twice as many species as any other habitat. Many of these species use deciduous forests specifically as nesting habitat. The fact that the deciduous forests on the MPF are mature and characterized by good structural diversity makes them especially suitable to a diverse avifaunal community. The presence of water (in sloughs, streams, and the Wood River) in or adjacent to much of the forested habitat increases the wildlife habitat value of these forests.

Although industrial areas can provide habitat for several avian species, their habitat suitability was determined to be very limited.

Mammals — Ten mammalian species were recorded on the MPF, including: the eastern cottontail, eastern chipmunk, woodchuck, fox squirrel, beaver, prairie vole, coyote, gray fox, raccoon, and white-tailed deer. As many as 14 deer were observed at one time.

The assessment of habitat conditions revealed notable differences among the cover types, based primarily on their vegetation structure. Use of open field, levee, recreation, wet meadow, and emergent wetland habitats was limited to those mammals that favor herbaceous vegetation and do not require the presence of woody plants. Most of the open fields are maintained by periodic mowing, thus there are few, if any, shrubs present. White-tailed deer were noted foraging extensively on the herbaceous vegetation present in open fields.

Shrub and deciduous forest habitats were found to be highly variable in terms of their habitat structure. These areas represent good habitat for mammals because they contain not only excellent ground cover, but also an abundant and wide assortment of tree cavities. The

abundance of large- and medium-sized snags, and their associated cavities, offer excellent habitat for raccoons, fox squirrels, and white-footed mice.

The industrial and agricultural portions of the MPF represent limited habitat for mammals, although there was some evidence of incidental use by white-tailed deer. But for the most part, these areas can only be considered as suitable habitat for introduced species, such as the house mouse and Norway rat, or in the case of agricultural areas, for feeding when crops are mature in the fall.

10.4.3 Threatened and Endangered Species

Plants — Letters from both the U.S. Fish and Wildlife Service and the Illinois Department of Conservation included no records of threatened or endangered plant species from either the MPF or the immediate area.

Based on a review of scientific literature, information provided by natural resource agencies, and an assessment of on-site habitat conditions, it was determined that large ground plum, decurrent false aster, and prairie spiderwort, three plant species listed as either threatened or endangered, have a remote possibility of occurring on the MPF. The field investigation, however, failed to locate any threatened or endangered plant species.

Wildlife— Letters from both the U.S. Fish and Wildlife Service and the Illinois Department of Conservation included no records of threatened or endangered wildlife species from either the MPF or the immediate area.

Based on a review of scientific literature, information provided by natural resource agencies, and an assessment of on-site habitat conditions, it was determined that five wildlife species listed as either threatened or endangered have a remote possibility of occurring on the MPF. These species included the Indiana bat, upland sandpiper, black-crowned night-heron, great egret, and Bewick's wren. The field investigation failed to locate any threatened or endangered wildlife species.

copy 1
ILD006271696

Screening Ecological Risk Assessment Report
(Revised August 1999)

Prepared for:

Olin Corporation
East Alton, Illinois

Prepared by:

ADVENT

ADVENT Project 48512

Environmental Consulting and Design

SCREENING ECOLOGICAL RISK ASSESSMENT REPORT

(REVISED AUGUST 1999)

Prepared for:

OLIN CORPORATION

East Alton, Illinois

Prepared by:

ADVENT ENVIRONMENTAL, INC.

Louisville, Kentucky

ADVENT Project 48512

Olin
427 N. SHAMROCK STREET
EAST ALTON, ILLINOIS 62024-1197

August 9, 1999

RECEIVED
WASTE MANAGEMENT BRANCH
Waste, Pesticides & Toxics Division
U.S. EPA – REGION 5

VIA OVERNIGHT MAIL

Ms. Juana Rojo
Corrective Action Project Manager
U.S. Environmental Protection Agency, Region V
77 West Jackson Boulevard – DW-8J
Chicago, Illinois 60604-3590

Subject: **Revised Screening Ecological Risk Assessment Report (August 1999)**
Olin Corporation
East Alton, Illinois
ILD006271696

Dear Juana:

Enclosed please find two copies of the Revised Screening Ecological Risk Assessment Report (Revised August 1999) (Report). This Report has been prepared to address USEPA's June 10, 1999 comments as agreed to during a conference call between USEPA and Olin held on July 12, 1999. A letter documenting Olin's understanding of the agreements reached during this conference call was submitted to you on July 13, 1999.

As agreed during the aforementioned conference call, Olin has revised the January 1999 Report to include those constituents previously eliminated by averaging as constituents of ecological concern (COECs). These changes are reflected in Section 3.3, Table 3 and Table 4 of the Report. Additionally, Olin has revised Section 4.0, Risk Management, to include statements that no potential exposure pathways were eliminated during performance of the SERA.

Olin believes that it has provided USEPA with a Report that can be approved. We are ready to resume Phase II RFI Work Plan (Work Plan) development activities as soon as Olin receives approval from USEPA for Phase I of the RFI, including the Report. Olin will submit a draft of the Work Plan, including the preliminary ecological risk assessment (PERA) Work Plan, to USEPA with 120 days from receipt of approval of the entire Phase I RFI.

Olin would once again like to thank you for your continued support on this matter. If you have any questions concerning this Report, please contact Mr. Phil Sutton of at 618-258-3780 or myself at 618-258-3633.

Sincerely,

M. F. Redington, Manager
Utilities and Environmental Services

Enclosure

Cc: R. A. Coomes – ADVENT
R. E. Mooshegian – ADVENT
J. A. Viebrock – ADVENT
P. L. Sutton - Olin

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1.0 INTRODUCTION

On June 6, 1997, Olin Corporation (Olin) submitted to USEPA, Region V, a Conceptual Approach to Performing an Ecological Risk Assessment (Conceptual Approach) for its Main Plant Facility (MPF) located in East Alton, Illinois. This submittal described several aspects of the Ecological Risk Assessment (ERA) process including performance of a Screening Ecological Risk Assessment (SERA). Olin agreed to prepare a SERA Work Plan and proposed a schedule for its submittal.

On July 24, 1997, Olin received notice from USEPA that the proposed Conceptual Approach and schedules for submittal of the SERA Work Plan (Work Plan) and Draft Phase II RFI Work Plan were acceptable. In accordance with the USEPA-approved approach and schedule, the SERA Work Plan was submitted for USEPA Region V approval on September 19, 1997. Olin received approval of the SERA Work Plan by USEPA Region V on February 23, 1998.

This SERA Report (Report) has been prepared and submitted in accordance with the USEPA-approved SERA Work Plan.

1.1 Statement of Purpose

This Report presents the methodology and results of the SERA for the MPF. The Report discusses the elements of the ERA process and describes the data and information developed during the Phase I RFI site characterization activities used to perform the SERA. These results provide the basis for the risk management summary discussed in Section 4.0. As described in the USEPA-approved conceptual approach and SERA Work Plan, and upon USEPA approval of this Report, the SERA results and risk management recommendations will be incorporated into the Phase II RFI Work Plan.

1.2 Guidance

The methodology and scope presented in this Report was developed from, and is consistent with, USEPA ecological risk assessment guidance documents. The primary guidance utilized to prepare this report was the *Proposed Guidelines for Ecological Risk Assessment* (Risk Assessment Forum, USEPA, Washington, D.C. August, 1996, EPA/630/R-95/002B). Additional guidance included: *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments, Internal Review Draft* (Environmental Response Team, USEPA, Edison, NJ. June, 1996); and *Ecological Risk Assessment Guidance for RCRA Corrective Action Region V, Interim Draft* (USEPA Region V Waste Management Division, Chicago, IL 1994). In addition to the aforementioned documents, additional guidance was obtained through personal communication with Messrs. Dan Mazur and William Enriquez of Region V.

1.3 Discussion of Scope of Work for the SERA

It is recognized throughout the guidance used to perform the SERA that ecological risk assessments usually follow a tiered or phased approach and vary in complexity from simple screening evaluations to detailed quantitative ecological risk assessments and studies. As stated in the USEPA-approved Work Plan, only those constituents at each SWMU which were identified in the Phase I RFI Report at concentrations equal to or greater than their corresponding practical quantification limit (PQL), and for which published ecological screening levels (ESLs) exist, were considered and carried through the SERA.

Risk-based screening levels were obtained from USEPA-recommended sources which included: *Preliminary Remediation Goals for Ecological Endpoints,* July, 1996, *Ecological Data Quality Levels* initially, August, 1996, then April, 1998, *Ecotox Thresholds* January, 1996, *Water Quality Criteria Summary Concentrations*, August, 1997, and *Supplemental Guidance to RAGS: Region 4 Bulletins Ecological Screening Values*, January, 1997. The risk-based screening levels served as the only ecological

screening levels (ESLs) used in the SERA. Consistent with the USEPA-approved SERA Work Plan, where the above listed sources do not provide ESLs for specific constituents, new values were not developed and those constituents have been removed from further consideration.

The elements of the ERA process as they applied to this SERA consisted of: 1) Problem Formulation; 2) Analysis; and 3) Risk Characterization. The goal of this SERA is to evaluate ecological risks associated with the site on a SWMU and media-specific basis. Where the evaluation demonstrates that no ecological risk is present, further assessment of ecological risk is not necessary and the ecological risk assessment process is complete. If potential ecological risks are identified, further evaluation or risk management decisions may be appropriate. The ERA process and the conclusions and recommendations concerning the need for additional ecological risk assessment are presented in this Report.

2.0 SITE CHARACTERIZATION

2.1 Site Background

Manufacturing operations have been conducted at the MPF by Olin since 1892. Two manufacturing entities of Olin (Brass and Winchester) currently operate at the MPF. Brass operations manufacture copper-based alloy strip and fabricated products. The Winchester operations manufacture small arms ammunition, ammunition components, and explosives. Environmental affairs for both divisions are coordinated by the Environmental Services Department.

The MPF is located in the Village of East Alton, Illinois, which is in the west-central part of the state (Figure 1). The MPF is approximately 17 miles northeast of St. Louis, Missouri, and 2 miles east of the Mississippi River. The East Fork of the Wood River runs through the MPF.

As stated above, industrial activities have been in operation since 1892. Facility designated Zones 1 through 7 are used for industrial purposes. Major manufacturing activities at the MPF are conducted in Zones 1, 2, and 4. Zone 1 has been the site of ammunition manufacturing and ballistics testing for more than 70 years. The Zone 2 area was used for the manufacturing of explosives beginning in 1892 and ending in approximately 1970. The fiber (cellulose) wad manufacturing process is still in operation in Zone 2. Zone 4 has been a manufacturing area for more than 45 years. Zones 3, 5, 6, and 7 are used for support operations in the form of incineration and steam production facilities, magazine storage for explosives, wastewater treatment facilities, and water filtration facilities, respectively. Zones 14 and 15 are recreational facilities for Olin employees. Historically, up to 74% of the facility has been used for industrial activities.

2.2 Phase I RCRA Facility Investigation

The MPF is subject to a two-phased RFI as described in Olin's RCRA permit. Phase I of the RFI was implemented in October 1994 by Philip Environmental (formerly Burlington

Environmental) in accordance with the USEPA-approved Phase I RFI Work Plan. During the Phase I activities, the geology and hydrogeology of the MPF and SWMU boundaries were defined. Figure 2 illustrates the SWMU locations. Samples of soil, sediment, surface water, and groundwater were collected and analyzed. Chemicals of potential concern (COPCs) were identified at each SWMU based on a human health risk evaluation.

Although not required by the USEPA-approved Phase I RFI Work Plan, Olin performed a baseline terrestrial ecology assessment during Phase I. This assessment observed and documented the flora and fauna at the MPF. No obvious disparities in species richness, abundance, or indications of contaminant impact (such as stressed vegetation or dead animals) were observed. No documentation revealed the presence of any U.S. Fish & Wildlife Service or Illinois Department of Conservation listed endangered or threatened species.

A Draft Phase I RFI Report (Draft Report) describing the Phase I activities was prepared and submitted to USEPA on September 29, 1995. The Draft Report includes analytical results of samples collected, conclusions, and recommendations for Phase II activities. Section 10 of the Draft Report discusses the terrestrial ecology assessment.

The USEPA-approved schedule includes final approval of the previously submitted Phase I RFI. Per agreement between USEPA and Olin, concurrent USEPA approval of this SERA Report and the Draft Phase I RFI Report will complete Phase I of the RFI. This will allow the subsequent development and preparation of the Phase II RFI Work Plan to incorporate recommendations for additional characterization and or evaluation presented in this Report.

2.3 Ecological Assessment

A site reconnaissance of the MPF was conducted on August 7, 1997, in order to update and validate SWMU-specific vegetative cover/land use conclusions presented in Chapter 10, Ecological Assessment, of the Draft Report. The Ecological Assessment

described the MPF by zones. The SERA builds upon the information presented in the Ecological Assessment with a SWMU-specific emphasis. During the site reconnaissance, several types of vegetative cover/land use were observed, and those directly associated with the SWMUs include: open water areas, seasonal water areas, deciduous forests, open fields, industrial areas (including parking areas), and agricultural fields. Table 1 identifies habitat types on a SWMU-specific basis. Appendix B presents potential wildlife ecological receptors as identified during the Ecological Assessment documented in the Draft Phase I RFI Report. The habitat types and anticipated receptors were considered during the SERA process as described in Section 3.0, particularly with respect to evaluating ESLs and overall risk characterization on a SWMU-specific basis.

3.0 ECOLOGICAL RISK ASSESSMENT

Ecological risk assessment is a process designed to estimate risk or the probability of adverse effects to ecological receptors. The ERA activities conducted as part of the SERA evaluated the likelihood that adverse ecological effects (risk) may or may not occur as a result of SWMU-specific conditions. In order for risk to be present, an ecological receptor must be exposed (or have the potential for exposure) to a stressor. The SERA focused on stressors (constituents detected at concentrations equal to or greater than their corresponding PQL) identified at each SWMU during Phase I of the RFI.

The SERA is not intended to be a complete baseline ecological site assessment for the MPF, but is designed to be used to help focus subsequent activities as part of the Phase II RFI. The following briefly describes the three phases of the ERA process used in performing the SERA.

3.1 Problem Formulation

The problem formulation phase of the SERA provides a framework for the subsequent analysis and risk characterization phases. During problem formulation, an overall conceptual model of how ecological effects may or may not occur as a result of conditions at the individual SWMUs has been identified. Due to the screening nature of the SERA process, the conceptual model is necessarily general in nature. The conceptual model developed during the problem formulation phase is designed to address potential receptors, exposure pathways, and ecological stressors in a manner which allows application of the model to each of the SWMUs addressed in this SERA.

The terrestrial ecological assessment performed during Phase I of the RFI was used to characterize important habitats and to assist in identifying potential ecological receptors. Habitat types identified during the Phase I RFI are summarized on a SWMU-specific

basis in Table 1, and associated potential wildlife ecological receptors are listed in Appendix B. The majority of SWMUs contain ecological habitat likely to support a wide range of potential ecological receptors. Although a few of the SWMUs are designated industrial, they also encompass areas of grasses, herbaceous plants, and sometimes shrubs. These areas are considered suitable for a number of ecological receptors including plants, invertebrates (earth worms) and small mammals (shrews). Because of the screening nature of this evaluation, an extensive assessment of all ecological receptors expected to be present at a SWMU was not conducted during the SERA. For the purposes of this SERA, it is assumed that ecological receptors used to develop the ESLs presented in this SERA may be or are likely to be present in the SWMUs evaluated. Therefore, SWMUs and potential ESLs have not been eliminated from further consideration during the SERA based on habitat or potential receptors.

Potential exposure pathways for soil include direct dermal contact, ingestion, and indirect ingestion through bioaccumulation through the food chain. Soil exposures are expected to involve primarily surface and or near-surface soils. Exposures of ecological receptors to deep (below 3 feet) soils are considered less likely. Exposures to other media of concern (sediment, surface water, groundwater) are expected to occur, if the subject media are present within a particular SWMU, through direct dermal contact, ingestion and indirect ingestion through the food chain. Exposures to groundwater were evaluated the same as potential exposures to surface water.

Constituent data collected during the Phase I RFI have been compiled on a SWMU-specific basis to identify those constituents to be assessed as ecological stressors during the SERA. Constituents reported at concentrations equal to or greater than their corresponding PQL and for which ESLs are available for the subject media were selected for analysis during the SERA process. The complete analytical data evaluated during the SERA process is presented in Table 2.

The conceptual model developed during the problem formulation phase of the SERA consists of potential sources of contamination (contaminated media), release mechanisms

(already released), exposure pathways (dermal, ingestion), and receptors (e.g. the shrew). Terrestrial receptors (plants, invertebrates, animals) were used for soil exposures and aquatic receptors were used for water exposures. To summarize the conceptual model: if Phase I RFI characterization data indicates the presence of potential contamination, then exposures by likely ecological receptors may occur, thus requiring analysis and characterization of potential ecological risks based on SWMU-specific conditions.

At the end of the problem formulation phase, data considered to be appropriate based on Agency guidance for use in the risk characterization of the SERA were identified. These data were used to determine potential exposures and exposure levels and then incorporated into the conceptual model for the SWMU during the analysis phase. Exposure levels were estimated based both on the maximum detected concentration and a media-specific basis. The exposure parameters identified by the respective agencies during development of the ESLs have been assumed to be appropriate for use during the SERA process. Additional exposure parameters were not developed as part of this SERA. The results of the problem formulation phase are summarized on a SWMU-specific basis in the risk characterization section (Section 3.3 and Table 2).

3.2 Analysis

The first step during the analysis phase of the SERA involved review and assessment of the Phase I RFI analytical results compiled during the problem formulation phase. The data review and assessment was performed in accordance with the USEPA-approved SERA Work Plan. All analytical results (including laboratory qualified and non-detect results) for each constituent encountered at a concentration equal to or greater than its corresponding PQL are included in the resulting SWMU and media-specific data set. This screening of available analytical data identified the constituents to be evaluated on a SWMU and media-specific basis. The frequency and magnitude of SWMU and media-specific constituents were further assessed by developing basic statistical parameters including the range and average of the constituents occurrences. The basic statistical values are summarized on a SWMU and media-specific basis in Table 3.

The second step of the analysis phase included the identification of available constituent and media-specific ESLs for the constituents selected for evaluation. As described in the approved SERA Work Plan, ESLs were obtained from the following sources:

Preliminary Remediation Goals for Ecological Endpoints
Environmental Restoration Risk Assessment Program
Oak Ridge National Laboratory
Oak Ridge, Tennessee, August, 1997, verified April, 1998

Ecological Data Quality Levels
USEPA Region V
Office of RCRA
Chicago, Illinois, April, 1998

Ecotox Thresholds
USEPA OSWER
EPA 540/F-95/038
January, 1996, verified April, 1998

Water Quality Criteria Summary Concentrations
USEPA OST Health and Ecological Criteria Division
1994, verified April, 1998

Supplemental Guidance to RAGS: Region 4 Bulletins
Ecological Screening Values
USEPA Region 4 Waste Management Division Office of Technical Services
January, 1997, verified April, 1998

The ESLs obtained from the above sources are summarized in the table titled Summary of Ecological Screening Levels (ESLs) provided in Appendix A. A review of the basis and development of ESL values was conducted to determine the most appropriate ESLs to be used for this SERA. The review determined that the Preliminary Remediation Goals (PRGs) prepared by Oak Ridge National Laboratory, and the recently released Ecological Data Quality Levels (EDQLs) from USEPA Region V (Received from Region V on 5/7/98) had the most extensive scientific justification. Because of the level of scientific justification, the number of ESLs available, and the location of MPF (within USEPA Region V), the EDQLs from USEPA Region V were selected as the recommended ESLs (RESLs) for this SERA.

For the purposes of this SERA process, and based on the review of ESL and RESL development, it is assumed that the toxicity and resulting ecological impact to exposed receptors have been incorporated into the ESLs and RESLs. A specific quantitative analysis of the toxicological effects and resulting ecological impacts was not performed during the SERA process.

The third step during the analysis phase included evaluating the ecological effects of the SWMU and media-specific constituent occurrences. This portion of the analysis phase required evaluating the constituent-specific exposure levels and the resulting possible ecological effects. The level of exposure is a function of direct contact to the constituent or uptake through ingestion. The opportunity for direct contact or uptake was qualitatively evaluated on a SWMU-specific basis. Specific quantitative levels of exposure were not assessed as part of the SERA.

For the purpose of the preliminary screening in this SERA, and consistent with the conceptual model developed during the problem formulation, if Phase I RFI data indicates the presence of potential contamination, then exposure through direct dermal, direct ingestion and indirect ingestion through the food chain are assumed to be present. In general, exposure to constituents reported in shallow samples (surface to 3 feet below ground surface (BGS)) is assumed, while exposure to constituents reported in deep samples (greater than 3 feet BGS) is considered less likely. Exposures to constituents and occurrences in sediment, surface water, and groundwater through direct dermal, direct consumption and indirect consumption are also assumed to occur where Phase I RFI data indicated the presence of potential contamination in the subject media. In general, the assessment of SWMU-specific exposures identified no significant justification for differences in exposures from those used to develop the ESLs and RESLs for purposes of this SERA. Therefore, for the purposes of the SERA process, the general exposure assumptions and parameters utilized to develop the RESLs are considered appropriate for the SWMU, media, and constituent-specific exposure evaluation.

The evaluation of potential ecological effects is also dependent upon the use of the ESLs and the RESLs. For the purposes of the SERA process, it has been assumed that the development of the available ESLs and the RESLs incorporate potential ecological effects resulting from receptor exposures to the subject constituents. Further quantification of the resulting ecological effects resulting from exposure to the constituents addressed has not been performed as part of the SERA process.

The evaluation of potential ecological effects is summarized in Tables 2 and 3. These tables provide direct SWMU and media-specific comparison of constituent occurrences to the available ESLs and the RESLs. Table 2 includes comparisons for each constituent occurrence. Table 3 provides basic statistical information regarding SWMU-specific constituent occurrences and provides a basis for evaluating the frequency and magnitude of constituent occurrences.

The analysis phase of the SERA characterized exposures as to the source, receptor, pathway, and extent of exposure to provide an exposure profile. These were qualitative evaluations in the SERA. The source of exposure was identified based on findings of the site characterization. If constituents were not identified at or above their PQLs, then no significant ecological source of a stressor was identified and further evaluation in the SERA was not conducted. Receptors which may experience exposures to constituents above screening levels in a given media were identified on a SWMU-specific basis.

3.3 Risk Characterization

Risk characterization is the last phase of the ecological risk assessment component of the SERA. In the risk characterization phase, the results of the problem formulation and the analysis phases are integrated to provide an evaluation of potential ecological risk. Risk evaluation is a function of the toxicity of a constituent and the level of exposure. Risk characterization is the method for identifying the likelihood of adverse ecological effects.

The risk characterization phase is focused on SWMU-specific data to provide a qualitative evaluation of potential risks. The risk characterization phase uses a focused, risk-screening evaluation rather than a full, quantitative assessment. Potential SWMU-specific risks are first characterized by evaluating the presence or absence of potential ecological stressors. Where potential stressors have not been identified by Phase I RFI characterization data, no risk is identified, no ecological risks are characterized, and no further evaluation is performed or recommended.

Where the presence of potential ecological stressors is indicated by the Phase I RFI data, potential receptors are assumed to be present and the potential ecological impact is evaluated through comparison of the stressor occurrences to the appropriate RESLs. Where constituents occurrences do not exceed the RESLs, the associated risk level is considered below the level of concern. Subsequently, the SWMU and media-specific constituent is not considered a constituent of ecological concern (COEC) and no further action is recommended.

Where RESLs have been exceeded, the constituent occurrence is further evaluated by assessing a number of factors including the relationship between the constituent occurrence and background values (when available). Background values used to assess constituents were taken from Table 9A-1 of the Draft Phase I RFI Report. These values were obtained from a 1984, U.S. Geological Survey professional paper titled *Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States.* Where the maximum detected concentrations of a constituent is less than the respective PQL, the RESL or the background value, the constituent is not retained as a COEC.

Because ESLs are by definition conservative estimates of concentrations at which significant adverse ecological effects are *not* expected to occur, there are safety factors incorporated into their development. Based on a review of scientific literature and methodologies used to develop ESLs, where constituent concentration occurrences or average constituent occurrences minimally exceed the corresponding RESL (within or only slightly above one order of magnitude of the RESL), the constituent is not expected

to pose a significant ecological risk. However, based on USEPA Region 5 comments, such constituents have been retained as COECs during the SERA process. Although these constituent occurrences are not expected to pose significant ecological risks, they have been retained through the SERA for further evaluation during later phases of the ERA process together with other constituents that exceeded RESLs and were also retained as COECs. This further evaluation may involve reviewing relative concentrations, frequencies of occurrence, scientific justification of RESLs, occurrence of other COECs, habitat and receptor characterization, and other SWMU and media-specific features to determine the applicability of retaining the constituent as a COEC through subsequent phases of the ERA process.

The SWMU and media-specific ecological screening results are summarized in Table 3, and the resulting list of SWMU and media-specific COECs is provided in Table 4. The risk characterization process is summarized for each SWMU in the following sections.

3.3.1 SWMU 1

SWMU 1 is located in the center of Zone 4 and is approximately 550 feet long and 160 feet wide. Relief across the SWMU is approximately 20 feet. The flat portion of the SWMU is sparsely vegetated. The area is currently used for parking and storage of materials associated with ongoing production activities. Phase I RFI characterization activities included the collection and laboratory analysis of test pit and surficial soil samples.

Soil

Screening of the SWMU 1 soil data indicates that the following constituents were detected at concentrations exceeding RESLs, and have therefore been retained as COECs in SWMU 1 soil and will be further evaluated during the ERA:

- Copper
- Lead
- Selenium
- Zinc
- Benzo(a)anthracene
- Benzo(a)pyrene
- Chrysene

3.3.2 SWMU 2

SWMU 2 is located in the northern portion of Zone 4 and is approximately 400 feet long and 260 feet wide. The area is relatively flat with about 2 feet of relief, and all but an approximately 5,000-square feet area located in the northwest corner is covered with grass. The remaining portion is covered with gravel and cinders. Phase I RFI characterization activities included the collection and laboratory analysis of test pit and surficial soil samples.

Soil

Screening of the SWMU 2 soil data indicates that the following constituents were detected at concentrations exceeding RESLs, and have therefore been retained as COECs in SWMU 2 soil and will be further evaluated during the ERA:

- Arsenic
- Chromium
- Copper
- Mercury
- Nickel
- Selenium
- Zinc
- Bis(2-ethylhexyl)phthalate

3.3.3 SWMU 3 & 4

SWMU 3 & 4 are located in the southwestern portion of the Zone 4. The two areas are listed together because the waste management activities associated with each SWMU took place in the same general area. The SWMU is approximately 2,000 feet long and 600 feet wide and is roughly triangular in shape. Relief across the SWMU is less than 10 feet at its widest point. SWMU 3 & 4 encompasses gravel and grass covered areas used for parking and storage areas. Phase I RFI characterization activities included the collection and laboratory analysis of soil samples from test pits and groundwater samples from existing monitoring wells.

Soil

Screening of the SWMU 3 & 4 soil data indicates that the following constituents were detected at concentrations exceeding RESLs, and have therefore been retained as COECs in SWMU 3 & 4 soil and will be further evaluated during the ERA:

- 2,4-Dinitrotoluene
- 2,6-Dinitrotoluene
- Antimony
- Arsenic
- Barium
- Cadmium
- Chromium
- Copper
- Lead
- Mercury
- Nickel
- Selenium
- Silver
- Zinc
- Benzo(a)anthracene
- Benzo(a)pyrene
- Bis(2-ethylhexyl)phthalate
- Chrysene
- Di-n-butyl phthalate
- N-Nitrosodiphenylamine

Groundwater

Screening of the SWMU 3 & 4 groundwater data indicates that the following constituents were detected at concentrations exceeding RESLs, and have therefore been retained as COECs in SWMU 3 & 4 groundwater and will be further evaluated during the ERA:

- Cadmium
- Bis(2-ethylhexyl)phthalate
- Vinyl chloride

3.3.4 SWMU 5

SWMU 5 is located in the southern portion of Zone 5, and is approximately 400 feet long and 200 feet wide. Relief across the area is approximately 30 feet and surface cover is primarily grass with several small areas where soil and cinders are exposed. The east side of the SWMU is somewhat level, however the west/northwest section consists of a steep slope. Phase I RFI characterization activities included the collection and laboratory analysis of test pit and surficial soil samples, sediment, and groundwater samples.

Soil

Screening of the SWMU 5 soil data indicates that the following constituents were detected at concentrations exceeding RESLs:

- 2,4-Dinitrotoluene
- 2,6-Dinitrotoluene
- Cadmium
- Copper
- Cyanide
- Lead
- Mercury
- Nickel
- Selenium
- Zinc
- Di-n-butyl phthalate

As described below, the ecological risks associated with the reported concentrations of the following constituent are not considered significant; therefore, the constituent has not been retained as a COEC:

- Di-n-butyl phthalate – the single Di-n-butyl phthalate occurrence which exceeds the RESL has been "B" qualified by the laboratory and data validator due to presence of the compound in a blank sample.

The following constituents have been retained as COECs in SWMU 5 soil and will be further evaluated during the ERA:

- 2,4-Dinitrotoluene
- 2,6-Dinitrotoluene
- Cadmium
- Copper
- Cyanide
- Lead
- Mercury
- Nickel
- Selenium
- Zinc

Sediment

Screening of the SWMU 5 sediment data indicates that the following constituents were detected at concentrations exceeding RESLs, and have therefore been retained as COECs in SWMU 5 sediment and will be further evaluated during the ERA:

- Arsenic
- Nickel

Groundwater

The Phase I RFI characterization activities included collection and laboratory analysis of a groundwater sample from the nearby groundwater monitoring well FDX-MW-110. No constituents were detected in groundwater at concentrations exceeding the RESLs. Therefore, it is not anticipated that additional characterization or evaluation of SWMU 5 groundwater quality will be necessary in subsequent phases of the ERA process. The need for further assessment will be based on data collected during the Phase I and Phase II activities.

3.3.5 SWMU 6

SWMU 6 is located in the southern portion of Zone 5. The SWMU has an irregular shape and is approximately 340 feet long and 160 feet wide. Relief across the SWMU is approximately 30 to 40 feet, and surface materials consist of grass cover over flat areas. Slopes within SWMU 6 are wooded. Phase I RFI characterization activities included the collection and laboratory analysis of test pit soil, sediment, and surface water samples.

Soil

Screening of the SWMU 6 soil data indicates that the following constituents were detected at concentrations exceeding RESLs, and have therefore been retained as COECs in SWMU 6 soil and will be further evaluated during the ERA:

- Antimony
- Arsenic
- Barium
- Cadmium
- Chromium
- Copper
- Cyanide
- Lead
- Mercury
- Nickel
- Selenium
- Silver
- Zinc
- N-Nitrosodiphenylamine

Sediment

Screening of the SWMU 6 sediment data indicates that the following constituents were detected at concentrations exceeding RESLs, and have therefore been retained as COECs in SWMU 6 sediment and will be further evaluated during the ERA:

- Arsenic
- Copper
- Cyanide
- Nickel
- Zinc

Surface Water

Screening of the SWMU 6 surface water analytical results does not indicate the presence of constituents at concentrations exceeding the RESLs. Therefore, it is not anticipated that additional characterization or evaluation of SWMU 6 surface water quality will be necessary in subsequent phases of the ERA process. The need for further assessment will be based on data collected during the Phase I and Phase II activities.

3.3.6 SWMU 7A

SWMU 7A is located near the center of Zone 2 and is approximately 470 feet long and 180 feet wide. The majority of the area is overgrown with brush and trees, with a small portion covered by grass. Phase I RFI characterization activities included the collection and laboratory analysis of test pit and surficial soil, sediment, and surface water samples.

Soil

Screening of the SWMU 7A soil data indicates that the following constituents were detected at concentrations exceeding RESLs, and have therefore been retained as COECs in SWMU 7A soil and will be further evaluated during the ERA:

- Benzo(a)anthracene
- Benzo(a)pyrene
- Benzo(b)fluoranthene
- Chrysene
- Fluoranthene
- Phenanthrene
- Pyrene

Sediment

Screening of the SWMU 7A sediment data indicates that the following constituents were detected at concentrations exceeding RESLs, and have therefore been retained as COECs in SWMU 7A sediment and will be further evaluated during the ERA:

- 2,4-Dinitrotoluene
- Benzo(a)anthracene
- Benzo(a)pyrene
- Benzo(g,h,i)perylene
- Chrysene
- Diethyl phthalate
- Di-n-butyl phthalate
- Fluoranthene
- Indeno(1,2,3-cd)pyrene
- N-Nitosodiphenylamine

Surface Water

Screening of the SWMU 7A surface water indicates that the following constituents were detected at concentrations exceeding RESLs, and have therefore been retained as COECs in SWMU 7A surface water and will be further evaluated during the ERA:

- Benzo(a)anthracene
- Benzo(a)pyrene
- Benzo(b)fluoranthene
- Benzo(k)fluoranthene
- Chrysene

3.3.7 SWMU 7B

SWMU 7B is located in the east central portion of Zone 2 and is approximately 300 feet long and 120 feet wide. Relief across the SWMU is approximately 6 feet. The area includes a drainage ditch which is moderately to heavily overgrown with brush and trees. The areas of SWMU 7B outside the drainage ditch are primarily grass covered. Phase I RFI characterization activities included the collection and laboratory analysis of subsurface soil, sediment, and groundwater samples.

Soil

Screening of the SWMU 7B soil data indicates that the following constituents were detected at concentrations exceeding RESLs, and have therefore been retained as COECs in SWMU 7B soil and will be further evaluated during the ERA:

- Napthalene
- N-Nitrosodiphenylamine

Sediment

Screening of the SWMU 7B sediment data indicates that the following constituent, reported as a Tentatively Identified Compound (TIC), was detected at a concentration exceeding the RESL, and has therefore been retained as a COEC in SWMU 7B sediment and will be further evaluated during the ERA:

- o,p'-DDT

3.3.8 SWMU 8

SWMU 8 is a slough located in the west central portion of Zone 2. Relief across the SWMU is approximately 10 feet from the top of the banks to the bottom of the slough. Surface water flow to the slough is intermittent; however, surface water is present most of the year. The banks of the slough are covered with trees and thick brush. Phase I RFI characterization activities included the collection and laboratory analysis of a sediment sample.

Sediment

Screening of the SWMU 8 sediment data indicates that the following constituent was detected at a concentration exceeding the RESL:

- Di-n-butyl phthalate

As described below, the ecological risks associated with the reported concentrations of the following constituent are not considered significant; therefore, the constituent has not been retained as a COEC:

- Di-n-butyl phthalate - encountered in a single sediment sample collected from a depth of 1.8 feet in SWMU 8. The reported concentration of 0.49 mg/Kg only slightly exceeds typical sample specific PQLs for the constituent. In addition, the reported concentration only slightly exceeds the RESL of 0.11 mg/Kg. The RESL corresponds to Region V's sediment ESL, however, available ESLs for Di-n-butyl phthalate range from 0.111 to 240 mg/Kg. In addition, the Phase I RFI report recommendations do not include additional site assessment activities for SWMU 8.

Therefore, additional characterization or evaluation of SWMU 8 sediment quality will not be included in subsequent phases of the ERA.

3.3.9 SWMU 9A

SWMU 9A encompasses a portion of a drainage ditch located in the southwest portion of Zone 2. Relief across the SWMU is approximately 10 feet from the top of the drainage ditch banks to the bottom of the ditch. Surface water flow through the area is intermittent. The sides and banks of the drainage ditch are heavily overgrown with brush, and exposed sediments are present in the bottom of the ditch. Phase I RFI characterization activities included the collection and laboratory analysis of sediment and surface water samples.

Sediment

Screening of the SWMU 9A sediment data indicates that the following constituents were detected at concentrations exceeding RESLs, and have therefore been retained as COECs in SWMU 9A sediment and will be further evaluated during the ERA:

- 2,4-Dinitrotoluene
- 2,6-Dinitrotoluene
- Di-n-butyl phthalate
- N-Nitrosodiphenylamine

Surface Water

Screening of SWMU 9A surface water analytical results does not indicate the presence of constituents at concentrations exceeding the RESLs. Therefore, it is not anticipated that additional characterization or evaluation of SWMU 9A surface water quality will be necessary in subsequent phases of the ERA process. The need for further assessment will be based on data collected during the Phase I and Phase II activities.

3.3.10 SWMU 9B

SWMU 9B encompasses a slough located in the southwest portion of Zone 2. Relief across the SWMU is approximately 10 feet from the top of the banks to the bottom of the slough. Surface water flow through the area is intermittent; however, surface water is present most of the year. The sides and banks of the slough are heavily overgrown with brush, and sediments are exposed in the bottom of the slough. Phase I RFI characterization activities included the collection and laboratory analysis of a sediment sample.

Sediment

Screening of the SWMU 9B sediment data indicates that the following constituent was detected at a concentration exceeding the RESL, and has therefore been retained as a COEC in SWMU 9B sediment and will be further evaluated during the ERA:

- N-Nitrosodiphenylamine

3.3.11 SWMU 9C

SWMU 9C encompasses a portion of a drainage ditch located in the southwest portion of Zone 2. Relief across the SWMU is approximately 5 to 10 feet from the top of the banks to the bottom of the ditch. Surface water flow through the area is intermittent. The sides and banks of the drainage ditch are heavily overgrown with brush, and sediments are exposed in the bottom of the ditch when surface water is present. Phase I RFI characterization activities included the collection and laboratory analysis of sediment and surface water samples.

Sediment

Screening of the SWMU 9C sediment data indicates that the following constituents were detected at concentrations exceeding the RESL, and have therefore been retained as COECs in SWMU 9C sediment and will be further evaluated during the ERA:

- 2,4-Dinitrotoluene
- 2,6-Dinitrotoluene
- Di-n-butyl phthalate
- N-Nitrosodiphenylamine

Surface Water

Screening of SWMU 9C surface water analytical results does not indicate the presence of constituents at concentrations exceeding the RESLs. Therefore, it is not anticipated that additional characterization or evaluation of SWMU 9C surface water quality will be necessary in subsequent phases of the ERA process. The need for further assessment will be based on data collected during the Phase I and Phase II activities.

3.3.12 SWMU 9D

SWMU 9D encompasses a drainage ditch located in the southwest portion of Zone 2. Relief across the SWMU is approximately 5 feet from the top of the banks to the bottom of the drainage ditch. Surface water flow through the area is intermittent. There is light to moderate tree growth in the general area of SWMU 9D. Phase I RFI characterization activities included the collection and laboratory analysis of a sediment sample.

Sediment

Screening of the SWMU 9D sediment data indicates that the following constituents were detected at concentrations exceeding RESLs, and have therefore been retained as COECs in SWMU 9D sediment and will be further evaluated during the ERA:

- 2,4-Dinitrotoluene
- 2,6-Dinitrotoluene
- Di-n-butyl phthalate
- N-Nitrosodiphenylamine
- Diphenylamine

3.3.13 SWMU 11

SWMU 11 encompasses a heavily overgrown drainage ditch in the northwest portion of Zone 2. Relief across the SWMU is less than 5 feet and surface water flow through the area is intermittent. Phase I RFI characterization activities included the collection and laboratory analysis of surficial soil and sediment samples.

Soil

Screening of the SWMU 11 soil data indicates that the following constituent was detected at a concentration exceeding the RESL:

- Di-n-butyl phthalate

As described below, the ecological risks associated with the reported concentrations of the following constituent are not considered significant; therefore, the constituent has not been retained as a COEC:

- Di-n-butyl phthalate - Di-n-butyl phthalate was encountered in a single soil sample collected from a depth of 0.5 feet in SWMU 11. The reported concentration of 6.9 mg/Kg exceeds the corresponding RESL of 0.15 mg/Kg. The RESL corresponds to Region V's soil ESL, however, available ESLs for Di-n-butyl phthalate range from 0.08 to 200 mg/Kg. In addition, the Phase I RFI report recommendations do not include additional site assessment activities for SWMU 11.

Therefore, additional characterization or evaluation of SWMU 11 soil quality will not be included in subsequent phases of the ERA.

Sediment

Screening of the SWMU 11 sediment analytical results does not indicate the presence of constituents at concentrations exceeding the RESLs. Therefore, the ERA process will not include additional characterization or evaluation of SWMU 11 sediment quality.

3.3.14 SWMU 12

SWMU 12 is located in the northwest portion of Zone 2 and is approximately 200 feet long and 80 feet wide. Relief across SWMU 12 is about 20 to 30 feet and the SWMU is heavily vegetated with brush, trees and weeds. Phase I RFI characterization activities included the collection and laboratory analysis of test pit soil samples.

Soil

Screening of the SWMU 12 soil data indicates that the following constituents were detected at concentrations exceeding RESLs, and have therefore been retained as COECs in SWMU 12 soil and will be further evaluated during the ERA:

- 2,6-Dinitrotoluene
- Arsenic
- Copper
- Lead
- Zinc
- Di-n-butyl phthalate

3.3.15 SWMU 13

SWMU 13 is located in the southwest portion of Zone 2 and is approximately 225 feet long and 120 feet wide. Relief across the SWMU is approximately 10 feet. The SWMU is heavily overgrown with brush, trees and weeds. Phase I RFI characterization activities included the collection and laboratory analysis of test pit and surficial soil samples.

Soil

Screening of the SWMU 13 soil data indicates that the following constituents were detected at concentrations exceeding RESLs, and have therefore been retained as COECs in SWMU 13 soil and will be further evaluated during the ERA:

- 2,4-Dinitrotoluene
- 2,6-Dinitrotoluene
- Mercury
- Zinc
- Di-n-butyl phthalate
- N-Nitrosodiphenylamine

3.3.16 SWMU 14

SWMU 14 is located in the northwest portion of Zone 2 and is approximately 300 feet long and 80 feet wide. Relief across the SWMU is approximately 10 to 20 feet. Surface cover consists of moderate to heavy brush, trees and weeds. Phase I RFI characterization activities included the collection and laboratory analysis of test pit and surficial soil and sediment samples.

Soil

Screening of the SWMU 14 soil data indicates that the following constituents were detected at concentrations exceeding RESLs, and have therefore been retained as COECs in SWMU 14 soil and will be further evaluated during the ERA:

- Arsenic
- Lead
- Mercury
- Selenium
- Zinc
- Bis(2-ethylhexyl)phthalate
- Di-n-butyl phthalate

Sediment

Screening of the SWMU 14 sediment data indicates that the following constituents were detected at concentrations exceeding RESLs, and have therefore been retained as COECs in SWMU 14 sediment and will be further evaluated during the ERA:

- Arsenic
- Copper
- Mercury

3.3.17 SWMU 15A

SWMU 15A encompasses a horseshoe-shaped slough approximately 1,040 feet long by 80 feet wide located in the north-central portion of Zone 1. The banks of the slough are covered with rock and concrete rubble. Flow through the SWMU is to the northeast. Phase I RFI characterization activities included the collection and laboratory analysis of sediment and surface water samples.

Sediment

Screening of the SWMU 15A sediment data indicates that the following constituents were detected at concentrations exceeding RESLs, and have therefore been retained as COECs in SWMU 15A sediment and will be further evaluated during the ERA:

- Arsenic
- Cadmium
- Chromium
- Copper
- Cyanide
- Lead
- Mercury
- Nickel
- Zinc
- Acenapthene
- Bis(2-ethylhexyl)phthalate
- Di-n-butyl phthalate
- Fluoranthene
- Fluorene
- Phenanthrene

Surface Water

Screening of the SWMU 15A surface water data indicates that the following constituents were detected at concentrations exceeding RESLs, and have therefore been retained as COECs in SWMU 15A surface water and will be further evaluated during the ERA:

- Copper
- Lead
- Zinc
- Chloroform

3.3.18 SWMU 15B

SWMU 15B consists of an L-shaped slough approximately 640 feet long and 90 feet wide located in Zone 1. Relief across the SWMU ranges from 4 to 10 feet from the top of the slough banks to the water surface. A roadway separates the north and south sections of the slough. A 20-inch pipe, under the roadway, hydraulically connects the two sections of the slough. The Phase I RFI characterization activities included the collection and laboratory analysis of surface water and groundwater samples.

Surface Water

Screening of the SWMU 15B surface water data indicates that the following constituents were detected at concentrations exceeding RESLs, and have therefore been retained as COECs in SWMU 15B surface water and will be further evaluated during the ERA:

- Copper
- Lead

Groundwater

Screening of the SWMU 15B groundwater data indicates that the following constituent was detected at a concentration exceeding the RESL, and has therefore been retained as a COEC in SWMU 15B groundwater and will be further evaluated during the ERA:

- Lead

3.3.19 SWMU 16

SWMU 16 consists of three areas, two located in the eastern portion of Zone 4 and the third located in Zone 14. The large portion located in Zone 4 consists of approximately 19 acres and has an irregular shape, which continues to be utilized as farmland. The small rectangle-shaped portion located in Zone 4 is approximately 280 feet long and 200 feet wide and is grass covered. The Zone 14 portion of this SWMU consists of approximately 15 acres and is utilized as farmland. Phase I RFI characterization activities included the collection and laboratory analysis of surficial and subsurface soil samples.

Soil

Screening of the SWMU 16 soil data indicates that the following constituents were detected at concentrations exceeding RESLs, and have therefore been retained as COECs in SWMU 16 soil and will be further evaluated during the ERA:

- 2,4-Dinitrotoluene
- 2,6-Dinitrotoluene
- Bis(2-ethylhexyl)phthalate
- Di-n-butyl phthalate
- N-Nitrosodiphenylamine

3.3.20 SWMU 17

SWMU 17 is located in the central portion of Zone 2. The SWMU is roughly circular in shape about 150 feet in diameter. Relief across the SWMU is less than 5 feet and it is heavily overgrown with brush and grass. Phase I RFI characterization activities included the collection and laboratory analysis of test pit and surficial soil samples.

Soil

Screening of the SWMU 17 soil data indicates that the following constituents were detected at concentrations exceeding RESLs:

- Antimony
- Arsenic
- Cadmium
- Chromium
- Copper
- Lead
- Mercury
- Nickel
- Selenium
- Silver
- Benzo(a)pyrene
- Di-n-butyl phthalate

As described below, the ecological risks associated with the reported concentrations of the following constituent are not considered significant; therefore, the constituent has not been retained as a COEC:

- Di-n-butyl phthalate – the single occurrence of Di-n-butyl phthalate has been "B" qualified by the laboratory and data validator due to the presence of the constituent in blank samples.

The following constituents have been retained as COECs in SWMU 17 soil and will be further evaluated during the ERA:

- Antimony
- Arsenic
- Cadmium
- Chromium
- Copper
- Lead
- Mercury
- Nickel
- Selenium
- Silver
- Benzo(a)pyrene

3.3.21 SWMU 18

SWMU 18 is located in the southern part of Zone 4. The SWMU is approximately 500 feet long and 70 feet wide. Relief across the SWMU is approximately 6 feet. The flat portion of the SWMU is sparsely vegetated with mixed gravel, weeds, and dirt. Brush, weeds, and trees cover part of the SWMU along the drainage ditch. Phase I RFI characterization activities included the collection and laboratory analysis of test pit and surficial soil and groundwater samples.

Soil

Screening of the SWMU 18 soil data indicates that the following constituents were detected at concentrations exceeding RESLs, and have therefore been retained as COECs in SWMU 18 soil and will be further evaluated during the ERA:

- Copper
- Lead
- Mercury
- Selenium
- Zinc
- Benzo(a)pyrene
- Di-n-butyl phthalate

Groundwater

Screening of the SWMU 18 groundwater data indicates that the following constituents were detected at concentrations exceeding RESLs, and have therefore been retained as COECs in SWMU 18 groundwater and will be further evaluated during the ERA:

- Cadmium
- Bis(2-ethylhexyl)phthalate

3.3.22 SWMU 19

SWMU 19 is located in the center of Zone 5 and is approximately 250 feet long and 100 feet wide with heavy grass cover and some brush and woods on the northern boundary. Relief across the SWMU is approximately 20 to 30 feet. Phase I RFI characterization activities included the collection and laboratory analysis of test pit and surficial soil and sediment samples.

Soil

Screening of the SWMU 19 soil data indicates that the following constituent was detected at concentrations exceeding the RESL, and has therefore been retained as a COEC in SWMU 19 soil and will be further evaluated during the ERA:

- Di-n-butyl phthalate

Sediment

Screening of the SWMU 19 sediment data indicates that the following constituents were detected at concentrations exceeding RESLs, and have therefore been retained as COECs in SWMU 19 sediment and will be further evaluated during the ERA:

- Arsenic
- Nickel

3.3.23 SWMU 20

SWMU 20 located in Zone 6 is irregularly shaped and is approximately 16 acres in size. The majority of the SWMU is paved and used as a parking lot. Only the southern- and northeastern-most portions of the SWMU are grass covered. Phase I RFI characterization activities included the collection and laboratory analysis of test pit soil samples.

Soil

Screening of the SWMU 20 soil data indicates that the following constituents were detected at concentrations exceeding RESLs, and have therefore been retained as COECs in SWMU 20 soil and will be further evaluated during the ERA:

- Antimony
- Arsenic
- Chromium
- Copper
- Lead
- Mercury
- Selenium
- Silver
- Zinc
- Benzo(a)pyrene
- Bis(2-ethylhexyl)phthalate

3.3.24 SWMU 22

SWMU 22 is located along a very steep embankment in the southwest part of Zone 2. The SWMU is approximately 500 feet long and 180 feet wide and has an oblong shape. Relief across the SWMU is approximately 50 feet. SWMU 22 is sparsely vegetated with brush, trees and weeds. Phase I RFI characterization activities included the collection and laboratory analysis of test pit soil samples.

Soil

Screening of the SWMU 22 soil data indicates that the following constituents were detected at concentrations exceeding RESLs, and have therefore been retained as COECs in SWMU 22 soil and will be further evaluated during the ERA:

- 2,4-Dinitrotoluene
- 2,6-Dinitrotoluene
- Antimony
- Arsenic
- Copper
- Lead
- Mercury
- Nickel
- Selenium
- Zinc
- Di-n-butyl phthalate
- N-Nitrosodiphenylamine

3.3.25 SWMU 23

SWMU 23 is located in the western portion of Zone 2. Relief across the SWMU is less than 5 feet. The ground surface is covered with a mixture of broken clay target material, grasses, trees, brush, and weeds. Phase I RFI characterization activities included the collection and laboratory analysis of test pit soil samples.

Soil

Screening of the SWMU 23 soil data indicates that the following constituents were detected at concentrations exceeding RESLs, and have therefore been retained as COECs in SWMU 23 soil and will be further evaluated during the ERA:

- 2,4 Dinitrotoluene
- 2,6 Dinitrotoluene
- Benzo(a)anthracene
- Benzo(a)pyrene
- Chrysene

3.3.26 SWMU 25

SWMU 25 is located in a densely vegetated area within the southwest portion of Zone 2. The SWMU is approximately 200 feet long and 100 feet wide and oblong-shaped. Relief across the SWMU is approximately 30 feet. Phase I RFI characterization activities included the collection and laboratory analysis of test pit and surficial soil samples.

Soil

Screening of the SWMU 25 soil data indicates that the following constituents were detected at concentrations exceeding RESLs:

- Arsenic
- Copper
- Lead
- Selenium
- Zinc
- Di-n-butyl phthalate

As described below, the ecological risks associated with the reported concentrations of the following constituent are not considered significant; therefore, the constituent has not been retained as a COEC:

- Di-n-butyl phthalate – the single occurrence of Di-n-butyl phthalate has been "B" qualified by the laboratory and "J" qualified by the data validator due to the presence of the constituents in blank samples.

The following constituents have been retained as COECs in SWMU 25 soil and will be further evaluated during the ERA:

- Arsenic
- Copper
- Lead
- Selenium
- Zinc

3.3.27 Ballistic Sands

The Ballistic Sands Disposal Areas are located in Zones 1, 4, and 7. Phase I RFI characterization activities included the collection and laboratory analysis of test pit soil samples.

Soil

Screening of the Ballistic Sands soil data indicates that the following constituents were detected at concentrations exceeding RESLs, and have therefore been retained as COECs in Ballastic Sands soil and will be further evaluated during the ERA:

- Copper
- Mercury
- Selenium
- Zinc

4.0 RISK MANAGEMENT SUMMARY

This SERA was conducted using data obtained during the Phase I RFI activities. The analytical data were evaluated on a SWMU and media-specific basis. Site descriptions, habitat assessment, and likely ecological receptors were also incorporated into this assessment.

The results of this SERA produced SWMU and media-specific COECs which are summarized in Table 4. It should be noted that potential exposure pathways were not eliminated during performance of the SERA. Subsequent phases of the ERA process will include additional characterization and or evaluation of constituents listed as SWMU and media-specific COECs. Pathways will be assessed during Phase II of the RFI using data gathered during Phase I and Phase II activities. Specific characterization and evaluation activities will be developed during and incorporated into the Phase II RFI Work Plan in conjunction with other SWMU-specific concerns. The need for further assessment of a SWMU, if any, will be based on data collected during the Phase I and Phase II activities.

This SERA is not intended to provide an absolute, quantitative evaluation of all potential ecological risks associated with the SWMUs. The risk characterization and selection of SWMU and media-specific COECs is based on a qualitative evaluation and is to be used to help focus Phase II RFI efforts.

TABLES

TABLE 1: SOLID WASTE MANAGEMENT UNIT (SWMU) HABITAT TYPES

SWMU	ZONE	TYPE
1	4	IN
2	4	IN/DF
3 & 4	4	IN/OF/DF
5	5	OF/DF
6	5	OF/DF
7A	2	OW/DF
7B	2	DF(W)
8	2	OW/DF
9A	2	DF
9B	2	DF
9C	2	DF
9D	2	DF
10	2	DF
11	2	DF/OW
12	2	DF
13	2	DF
14	2	DF
15A	1	OW
15B	1	OW
16	14 & 4	AG/DF/OF
17	2	OW/DF
18	4	AG/DF/IN
19	5	OF
20	6	IN/OF
22	3	DF
23	2	DF/SH
24	2	DF
25	2	DF
26	2	DF/OF
Ballistics Sand Area	1	IN

Prepared by: MAM 3/18/98
Checked by: BHB 3/18/98

Notes:
OF = Open field (includes Open field, Levee, and Recreation)
SH = Shrub
DF = Decidious Forest
DF(W) = Deciduous Forest/Wet
OW = Open Water
WM = Wet Meadow
AG = Agriculture
IN = Industrial

TABLE 3 - SUMMARY OF SWMU AND MEDIA SPECIFIC ECOLOGICAL RISK SCREENING RESULTS

Area/Media	Constituent: Compound	Type	Units	Summary of Analytical Data: Number of Samples[1]	Number of Values Exceeding PQL[2]	Number of Values Exceeding RESL[3]	Number of Values Exceeding Backgn	Concentration Range: Max.[4]	Min.[5]	Average[6]	RESLs[7]: Screening Conc.	SERA Status
SWMU 1												
SOIL	Copper	Inorganic	mg/kg	3	3	3	2	400	13.4	222.467	0.313	C
	Lead	Inorganic	mg/kg	3	3	3	2	76.4	32.6	57.267	0.46	C
	Selenium	Inorganic	mg/kg	3	2	2	1	1.1	ND	0.827	0.028	C
	Zinc	Inorganic	mg/kg	3	3	3	2	1310	51.3	704.433	6.6	C
	Benzo(a)anthracene	SVOC	mg/kg	3	2	2	-	41	0.087	16.000	5.21	C
	Benzo(a)pyrene	SVOC	mg/kg	3	2	2	-	39	0.072	14.791	1.52	C
	Chrysene	SVOC	mg/kg	3	2	2	-	39	0.099	15.433	4.73	C
SEDIMENT	Not Applicable											
SURFACE WATER	Not Applicable											
GROUND WATER	Not Applicable											
SWMU 2												
SOIL	Arsenic	Inorganic	mg/kg	3	3	2	1	23.7	2	11.867	5.7	C
	Chromium	Inorganic	mg/kg	3	3	3	1	93.8	14.2	41.200	0.4	C
	Copper	Inorganic	mg/kg	3	3	3	3	29500	149	9977.667	0.313	C
	Mercury	Inorganic	mg/kg	3	2	2	1	1.2	ND	0.492	0.008	C
	Nickel	Inorganic	mg/kg	3	3	2	1	68.9	8.9	32.300	13.6	C
	Selenium	Inorganic	mg/kg	3	2	2	1	3	ND	1.465	0.028	C
	Zinc	Inorganic	mg/kg	3	3	3	3	2710	165	1037.667	6.6	C
	Bis(2-ethylhexyl)phthalate	SVOC	mg/kg	3	2	1	-	2.2	ND	1.061	0.926	C
SEDIMENT	Not Applicable											
SURFACE WATER	Not Applicable											
GROUND WATER	Not Applicable											

TABLE 3 - SUMMARY OF SWMU AND MEDIA SPECIFIC ECOLOGICAL RISK SCREENING RESULTS

Area/Media	Constituent: Compound	Type	Units	Summary of Analytical Data: Number of Samples[1]	Number of Values Exceeding PQL[2]	Number of Values Exceeding RESL[3]	Number of Values Exceeding Backgn	Concentration Range: Max.[4]	Min.[5]	Average[6]	RESLs[7]: Screening Conc.	SERA Status
SWMU 3 & 4												
SOIL	2,4-Dinitrotoluene	Explosive	mg/kg	4	2	1	-	1.6	ND	0.636	1.28	C
	2,6-Dinitrotoluene	Explosive	mg/kg	4	1	1	-	0.61	ND	0.278	0.033	C
	Antimony	Inorganic	mg/kg	4	2	2	1	139	ND	35.093	0.142	C
	Arsenic	Inorganic	mg/kg	4	4	1	1	126	2.9	34.725	5.7	C
	Barium	Inorganic	mg/kg	4	4	4	1	1010	60.5	333.125	1.04	C
	Cadmium	Inorganic	mg/kg	4	2	2	2	35.3	ND	11.820	0.181	C
	Chromium	Inorganic	mg/kg	4	4	4	1	186	9	58.050	0.4	C
	Copper	Inorganic	mg/kg	4	4	4	2	24900	10.2	6956.225	0.313	C
	Lead	Inorganic	mg/kg	4	4	4	2	14200	8.9	3608.750	0.46	C
	Mercury	Inorganic	mg/kg	4	3	3	1	2.5	ND	0.818	0.008	C
	Nickel	Inorganic	mg/kg	4	4	3	1	275	9.6	82.275	13.6	C
	Selenium	Inorganic	mg/kg	4	2	2	2	10.2	ND	4.179	0.028	C
	Silver	Inorganic	mg/kg	4	2	1	1	11.7	ND	3.060	4.04	C
	Zinc	Inorganic	mg/kg	4	4	4	2	16400	32.9	6258.275	6.6	C
	Benzo(a)anthracene	SVOC	mg/kg	4	1	1	-	28	ND	7.109	5.21	C
	Benzo(a)pyrene	SVOC	mg/kg	4	1	1	-	18	ND	4.659	1.52	C
	Bis(2-ethylhexyl)phthalate	SVOC	mg/kg	4	2	1	-	22	0.1	5.740	0.926	C
	Chrysene	SVOC	mg/kg	4	1	1	-	33	ND	8.359	4.73	C
	Di-n-butyl phthalate	SVOC	mg/kg	4	1	1	-	2.6	ND	0.685	0.15	C
	N-Nitrosodiphenylamine	SVOC	mg/kg	4	1	1	-	2.2	ND	0.821	0.646	C
SEDIMENT	Not Applicable											
SURFACE WATER	Not Applicable											
GROUNDWATER	Cadmium	Inorganic	ug/l	7	1	1	-	1.3	ND	0.614	0.66	C
	Bis(2-ethylhexyl)phthalate	SVOC	ug/l	7	3	3	-	30	5	11.143	2.1	C
	Vinyl chloride	VOC	ug/l	8	2	2	-	53	ND	13.875	9.2	C

TABLE 3 - SUMMARY OF SWMU AND MEDIA SPECIFIC ECOLOGICAL RISK SCREENING RESULTS

Area/Media	Constituent: Compound	Type	Units	Summary of Analytical Data: Number of Samples[1]	Number of Values Exceeding PQL[2]	Number of Values Exceeding RESL[3]	Number of Values Exceeding Backgn	Concentration Range: Max.[4]	Min.[5]	Average[6]	RESLs[7]: Screening Conc.	SERA Status
SWMU 5												
SOIL	2,4-Dinitrotoluene	Explosive	mg/kg	3	1	1	-	26	ND	8.750	1.28	C
	2,6-Dinitrotoluene	Explosive	mg/kg	3	1	1	-	3.6	ND	1.283	0.033	C
	Cadmium	Inorganic	mg/kg	3	3	3	1	25	0.34	9.047	0.181	C
	Copper	**Inorganic**	**mg/kg**	**3**	**3**	**3**	**3**	**10400**	**394**	**3878.000**	**0.313**	**C**
	Cyanide	**Inorganic**	**mg/kg**	**3**	**1**	**1**	-	**2.2**	**ND**	**0.923**	**1.33**	**C**
	Lead	**Inorganic**	**mg/kg**	**3**	**3**	**3**	**3**	**337**	**151**	**242.667**	**0.46**	**C**
	Mercury	**Inorganic**	**mg/kg**	**3**	**3**	**3**	**3**	**42.6**	**3**	**16.300**	**0.008**	**C**
	Nickel	**Inorganic**	**mg/kg**	**3**	**3**	**3**	**1**	**41.3**	**16.4**	**25.700**	**13.6**	**C**
	Selenium	Inorganic	mg/kg	3	3	3	2	4.6	0.92	3.007	0.028	C
	Zinc	Inorganic	mg/kg	3	3	3	3	54200	272	18630.667	6.6	C
	Di-n-butyl phthalate	SVOC	mg/kg	3	1	1	-	3.9	0.37	1.607	0.15	Q
SEDIMENT	Arsenic	Inorganic	mg/kg	1	1	1	-	9.1	9.1	9.100	6	C
	Nickel	Inorganic	mg/kg	1	1	1	-	19.2	19.2	19.200	16	C
SURFACE WATER	Not Applicable											
GROUNDWATER	No RESL Exceedances											
SWMU 6												
SOIL	Antimony	Inorganic	mg/kg	2	2	2	1	79.5	0.51	40.005	0.142	C
	Arsenic	Inorganic	mg/kg	2	2	2	1	56.9	9.2	33.050	5.7	C
	Barium	Inorganic	mg/kg	2	2	2	1	2900	262	1581.000	1.04	C
	Cadmium	Inorganic	mg/kg	2	2	2	1	13.7	2.7	8.200	0.181	C
	Chromium	Inorganic	mg/kg	2	2	2	2	201	132	166.500	0.4	C
	Copper	Inorganic	mg/kg	2	2	2	2	35000	1680	18340.000	0.313	C
	Cyanide	Inorganic	mg/kg	2	1	1	-	1.4	ND	0.875	1.33	C
	Lead	Inorganic	mg/kg	2	2	2	2	27200	153	13676.500	0.46	C
	Mercury	Inorganic	mg/kg	2	2	2	2	2.2	0.91	1.555	0.008	C
	Nickel	Inorganic	mg/kg	2	2	2	2	294	196	245.000	13.6	C
	Selenium	Inorganic	mg/kg	2	2	2	2	4.2	2.4	3.300	0.028	C
	Silver	Inorganic	mg/kg	2	2	1	1	5.8	0.37	3.085	4.04	C
	Zinc	Inorganic	mg/kg	2	2	2	2	19600	1950	10775.000	6.6	C
	N-Nitrosodiphenylamine	SVOC	mg/kg	2	1	1	-	0.78	ND	0.503	0.646	C
SEDIMENT	Arsenic	Inorganic	mg/kg	1	1	1	-	8.5	8.5	8.500	6	C
	Copper	Inorganic	mg/kg	1	1	1	-	34.2	34.2	34.200	16	C
	Cyanide	Inorganic	mg/kg	1	1	1	-	0.72	0.72	0.720	0.1	C
	Nickel	Inorganic	mg/kg	1	1	1	-	31.6	31.6	31.600	16	C
	Zinc	Inorganic	mg/kg	1	1	1	-	127	127	127.000	120	C
SURFACE WATER	No RESL Exceedances											
GROUND WATER	Not Applicable											

TABLE 3 - SUMMARY OF SWMU AND MEDIA SPECIFIC ECOLOGICAL RISK SCREENING RESULTS

Area/Media	Constituent: Compound	Type	Units	Summary of Analytical Data: Number of Samples[1]	Number of Values Exceeding PQL[2]	Number of Values Exceeding RESL[3]	Number of Values Exceeding Backgn	Concentration Range: Max.[4]	Min.[5]	Average[6]	RESLs[7]: Screening Conc.	SERA Status
SWMU 7A												
SOIL	Benzo(a)anthracene	SVOC	mg/kg	3	3	2	-	220	0.84	84.280	5.21	C
	Benzo(a)pyrene	SVOC	mg/kg	3	2	1	-	190	ND	65.237	1.52	C
	Benzo(b)fluoranthene	SVOC	mg/kg	3	3	1	-	240	0.98	88.327	59.8	C
	Chrysene	SVOC	mg/kg	3	3	2	-	210	0.9	79.300	4.73	C
	Fluoranthene	SVOC	mg/kg	3	3	1	-	260	1.3	101.767	122	C
	Phenanthrene	SVOC	mg/kg	3	3	1	-	80	0.44	32.813	46.7	C
	Pyrene	SVOC	mg/kg	3	3	1	-	260	1.1	88.567	78.6	C
SEDIMENT	2,4-Dinitrotoluene	Explosive	mg/kg	1	1	1	-	0.66	0.66	0.660	0.075	C
	Benzo(a)anthracene	SVOC	mg/kg	1	1	1	-	1.2	1.2	1.200	0.032	C
	Benzo(a)pyrene	SVOC	mg/kg	1	1	1	-	1.1	1.1	1.100	0.032	C
	Benzo(g,h,i)perylene	SVOC	mg/kg	1	1	1	-	0.77	0.77	0.770	0.17	C
	Chrysene	SVOC	mg/kg	1	1	1	-	1	1	1.000	0.057	C
	Diethyl phthalate	SVOC	mg/kg	1	1	1	-	0.82	0.82	0.820	0.008	C
	Di-n-butyl phthalate	SVOC	mg/kg	1	1	1	-	10	10	10.000	0.111	C
	Fluoranthene	SVOC	mg/kg	1	1	1	-	1.6	1.6	1.600	0.111	C
	Indeno(1,2,3-cd)pyrene	SVOC	mg/kg	1	1	1	-	0.83	0.83	0.830	0.2	C
	N-Nitrosodiphenylamine	SVOC	mg/kg	1	1	1	-	5.6	5.6	5.600	0.155	C
SURFACE WATER	Benzo(a)anthracene	SVOC	ug/l	1	1	1	-	5.2	5.2	5.200	0.839	C
	Benzo(a)pyrene	SVOC	ug/l	1	1	1	-	11	11	11.000	0.014	C
	Benzo(b)fluoranthene	SVOC	ug/l	1	1	1	-	11	11	11.000	9.07	C
	Benzo(k)fluoranthene	SVOC	ug/l	1	1	1	-	4.1	4.1	4.100	0.006	C
	Chrysene	SVOC	ug/l	1	1	1	-	2	2	2.000	0.033	C
GROUND WATER	Not Applicable											
SWMU 7B												
SOIL	Naphthalene	SVOC	mg/kg	5	1	1	-	1.1	ND	0.380	0.099	C
	N-Nitrosodiphenylamine	SVOC	mg/kg	5	2	1	-	1.5	ND	0.542	0.646	C
SEDIMENT	o,p'-DDT	SVOC	mg/kg	1	1	1	-	0.43	0.43	0.430	0.001	C
SURFACE WATER	Not Applicable											
GROUND WATER	Not Applicable											

TABLE 3 - SUMMARY OF SWMU AND MEDIA S' 'FIC ECOLOGICAL RISK SCREENING RESULTS

Area/Media	Constituent: Compound	Type	Units	Summary of Analytical Data: Number of Samples[1]	Number of Values Exceeding PQL[2]	Number of Values Exceeding RESL[3]	Number of Values Exceeding Backgn	Concentration Range: Max.[4]	Min.[5]	Average[6]	RESLs[7]: Screening Conc.	SERA Status
SWMU 8												
SOIL	Not Applicable											
SEDIMENT	Di-n-butyl phthalate	SVOC	mg/kg	1	1	1	-	0.49	0.49	0.490	0.111	R1.0
SURFACE WATER	Not Applicable											
GROUND WATER	Not Applicable											
SWMU 9A												
SOIL	Not Applicable											
SEDIMENT	2,4-Dinitrotoluene	Explosive	mg/kg	2	2	2	-	14	0.38	7.190	0.075	C
	2,6-Dinitrotoluene	Explosive	mg/kg	2	1	1	-	1.6	ND	0.863	0.021	C
	Di-n-butyl phthalate	SVOC	mg/kg	2	2	2	-	8.7	1.3	5.000	0.111	C
	N-Nitrosodiphenylamine	SVOC	mg/kg	2	2	2	-	9.2	6.5	7.850	0.155	C
SURFACE WATER	No RESL Exceedances											
GROUND WATER	Not Applicable											
SWMU 9B												
SOIL	Not Applicable											
SEDIMENT	N-Nitrosodiphenylamine	SVOC	mg/kg	1	1	1	-	2.4	2.4	2.400	0.155	C
SURFACE WATER	Not Applicable											
GROUND WATER	Not Applicable											

TABLE 3 - SUMMARY OF SWMU AND MEDIA SPECIFIC ECOLOGICAL RISK SCREENING RESULTS

Area/Media	Constituent: Compound	Type	Units	Summary of Analytical Data: Number of Samples[1]	Number of Values Exceeding PQL[2]	Number of Values Exceeding RESL[3]	Number of Values Exceeding Backgn	Concentration Range: Max.[4]	Min.[5]	Average[6]	RESLs[7]: Screening Conc.	SERA Status
SWMU 9C												
SOIL	Not Applicable											
SEDIMENT	2,4-Dinitrotoluene	Explosive	mg/kg	2	2	2	-	27	21	24.000	0.075	C
	2,6-Dinitrotoluene	Explosive	mg/kg	2	2	2	-	2.8	2.8	2.800	0.021	C
	Di-n-butyl phthalate	SVOC	mg/kg	2	2	2	-	69	22	45.500	0.111	C
	N-Nitrosodiphenylamine	SVOC	mg/kg	2	2	2	-	9.9	4.4	7.150	0.155	C
SURFACE WATER	No RESL Exceedances											
GROUND WATER	Not Applicable											
SWMU 9D												
SOIL	Not Applicable											
SEDIMENT	2,4-Dinitrotoluene	Explosive	mg/kg	1	1	1	-	42	42	42.000	0.075	C
	2,6-Dinitrotoluene	Explosive	mg/kg	1	1	1	-	3.3	3.3	3.300	0.021	C
	Di-n-butyl phthalate	SVOC	mg/kg	1	1	1	-	10	10	10.000	0.111	C
	N-Nitrosodiphenylamine	SVOC	mg/kg	1	1	1	-	7.9	7.9	7.900	0.155	C
	Diphenylamine	SVOC	mg/kg	1	1	1	-	0.16	0.16	0.160	0.035	C
SURFACE WATER	Not Applicable											
GROUND WATER	Not Applicable											
SWMU 11												
SOIL	Di-n-butyl phthalate	SVOC	mg/kg	1	1	1	-	6.9	6.9	6.900	0.15	R1.0
SEDIMENT	No RESL Exceedances											
SURFACE WATER	Not Applicable											
GROUND WATER	Not Applicable											

TABLE 3 - SUMMARY OF SWMU AND MEDIA SPECIFIC ECOLOGICAL RISK SCREENING RESULTS

Area/Media	Constituent: Compound	Type	Units	Summary of Analytical Data: Number of Samples[1]	Number of Values Exceeding PQL[2]	Number of Values Exceeding RESL[3]	Number of Values Exceeding Backgn	Concentration Range: Max.[4]	Min.[5]	Average[6]	RESLs[7]: Screening Conc.	SERA Status
SWMU 12												
SOIL	2,6-Dinitrotoluene	Explosive	mg/kg	3	1	1	-	0.25	ND	0.167	0.033	C
	Arsenic	Inorganic	mg/kg	3	3	3	3	38.2	11.1	25.067	5.7	C
	Copper	Inorganic	mg/kg	3	3	3	2	547	29.6	242.533	0.313	C
	Lead	Inorganic	mg/kg	3	3	3	2	231	23.6	113.800	0.46	C
	Zinc	Inorganic	mg/kg	3	3	3	2	894	120	499.333	6.6	C
	Di-n-butyl phthalate	SVOC	mg/kg	3	3	3	-	0.7	0.48	0.593	0.15	C
SEDIMENT	Not Applicable											
SURFACE WATER	Not Applicable											
GROUND WATER	Not Applicable											
SWMU 13												
SOIL	2,4-Dinitrotoluene	Explosive	mg/kg	3	2	2	-	13	ND	5.708	1.28	C
	2,6-Dinitrotoluene	Explosive	mg/kg	3	2	2	-	3.2	ND	1.212	0.033	C
	Mercury	Inorganic	mg/kg	3	3	3	1	1.9	0.11	0.763	0.008	C
	Zinc	Inorganic	mg/kg	3	3	3	1	132	77.9	97.033	6.6	C
	Di-n-butyl phthalate	SVOC	mg/kg	3	2	2	-	6.3	ND	2.703	0.15	C
	N-Nitrosodiphenylamine	SVOC	mg/kg	3	2	2	-	5.3	ND	3.070	0.646	C
SEDIMENT	Not Applicable											
SURFACE WATER	Not Applicable											
GROUND WATER	Not Applicable											

TABLE 3 - SUMMARY OF SWMU AND MEDIA SPECIFIC ECOLOGICAL RISK SCREENING RESULTS

Area/Media	Constituent: Compound	Type	Units	Summary of Analytical Data: Number of Samples[1]	Number of Values Exceeding PQL[2]	Number of Values Exceeding RESL[3]	Number of Values Exceeding Backgn	Concentration Range: Max.[4]	Min.[5]	Average[6]	RESLs[7]: Screening Conc.	SERA Status
SWMU 14												
SOIL	Arsenic	Inorganic	mg/kg	3	3	3	2	43.8	8.9	21.567	5.7	C
	Lead	Inorganic	mg/kg	3	3	3	1	162	32.8	82.433	0.46	C
	Mercury	Inorganic	mg/kg	3	2	2	1	0.67	ND	0.333	0.008	C
	Selenium	Inorganic	mg/kg	3	1	1	1	2.3	ND	1.033	0.028	C
	Zinc	Inorganic	mg/kg	3	3	3	1	291	88.5	166.167	6.6	C
	Bis(2-ethylhexyl)phthalate	SVOC	mg/kg	3	1	1	-	1.5	ND	0.637	0.926	C
	Di-n-butyl phthalate	SVOC	mg/kg	2	1	1	-	0.63	0.084	0.357	0.15	C
SEDIMENT	Arsenic	Inorganic	mg/kg	1	1	1	-	9	9	9.000	6	C
	Copper	Inorganic	mg/kg	1	1	1	-	20.3	20.3	20.300	16	C
	Mercury	Inorganic	mg/kg	1	1	1	-	0.23	0.23	0.230	0.2	C
SURFACE WATER	Not Applicable											
GROUND WATER	Not Applicable											
SWMU 15A												
SOIL	Not Applicable											
SEDIMENT	Arsenic	Inorganic	mg/kg	3	3	2	-	8.7	3.9	6.333	6	C
	Cadmium	Inorganic	mg/kg	3	3	3	-	23.3	1	10.400	0.6	C
	Chromium	Inorganic	mg/kg	3	3	2	-	50.4	15.7	35.867	26	C
	Copper	Inorganic	mg/kg	3	3	3	-	5160	233	2022.667	16	C
	Cyanide	Inorganic	mg/kg	3	1	1	-	4	ND	1.572	0.1	C
	Lead	Inorganic	mg/kg	3	3	3	-	287	56.9	169.967	31	C
	Mercury	Inorganic	mg/kg	3	3	3	-	52.4	5.7	34.967	0.2	C
	Nickel	Inorganic	mg/kg	3	3	2	-	24.1	11.3	18.067	16	C
	Zinc	Inorganic	mg/kg	3	3	3	-	18600	356	7435.333	120	C
	Acenaphthene	SVOC	mg/kg	3	1	1	-	0.054	ND	0.054	0.007	C
	Bis(2-ethylhexyl)phthalate	SVOC	mg/kg	3	1	1	-	1.9	ND	1.243	0.182	C
	Di-n-butyl phthalate	SVOC	mg/kg	3	1	1	-	4.6	ND	2.060	0.111	C
	Fluoranthene	SVOC	mg/kg	3	1	1	-	0.5	ND	0.500	0.111	C
	Fluorene	SVOC	mg/kg	3	1	1	-	0.046	ND	0.046	0.021	C
	Phenanthrene	SVOC	mg/kg	3	1	1	-	0.34	ND	0.340	0.042	C
SURFACE WATER	Copper	Inorganic	ug/l	1	1	1	-	127	127	127.000	6	C
	Lead	Inorganic	ug/l	1	1	1	-	21.6	21.6	21.600	1.3	C
	Zinc	Inorganic	ug/l	1	1	1	-	136	136	136.000	58.9	C
	Chloroform	VOC	ug/l	1	1	1	-	81	81	81.000	79	C
GROUND WATER	Not Applicable											

TABLE 3 - SUMMARY OF SWMU AND MEDIA S[illegible]FIC ECOLOGICAL RISK SCREENING RESULTS

Area/Media	Constituent: Compound	Type	Units	Summary of Analytical Data: Number of Samples[1]	Number of Values Exceeding PQL[2]	Number of Values Exceeding RESL[3]	Number of Values Exceeding Backgn	Concentration Range: Max.[4]	Min.[5]	Average[6]	RESLs[7]: Screening Conc.	SERA Status
SWMU 15B												
SOIL	Not Applicable											
SEDIMENT	Not Applicable											
SURFACE WATER	Copper	Inorganic	ug/l	1	1	1		73	73	73.000	6	C
	Lead	Inorganic	ug/l	1	1	1		174	174	174.000	1.3	C
GROUND WATER	Lead	Inorganic	ug/l	4	2	1		19.6	ND	5.450	1.3	C
SWMU 16												
SOIL	2,4-Dinitrotoluene	Explosive	mg/kg	9	7	6	-	29	ND	10.994	1.28	C
	2,6-Dinitrotoluene	Explosive	mg/kg	9	6	6	-	2.7	ND	0.977	0.033	C
	Bis(2-ethylhexyl)phthalate	SVOC	mg/kg	9	3	2	-	1.6	ND	1.600	0.928	C
	Di-n-butyl phthalate	SVOC	mg/kg	9	6	6	-	64	ND	15.851	0.15	C
	N-Nitrosodiphenylamine	SVOC	mg/kg	9	1	1	-	8.9	ND	2.543	0.646	C
SEDIMENT	Not Applicable											
SURFACE WATER	Not Applicable											
GROUND WATER	Not Applicable											
SWMU 17												
SOIL	Antimony	Inorganic	mg/kg	3	3	3	1	18.3	0.61	6.570	0.142	C
	Arsenic	Inorganic	mg/kg	3	3	2	2	31.1	2.2	14.833	5.7	C
	Cadmium	Inorganic	mg/kg	3	2	2	1	38.6	ND	13.177	0.181	C
	Chromium	Inorganic	mg/kg	3	3	3	1	126	6.9	48.633	0.4	C
	Copper	Inorganic	mg/kg	3	3	3	1	10100	8.5	3379.300	0.313	C
	Lead	Inorganic	mg/kg	3	3	3	2	3180	6.6	1103.200	0.46	C
	Mercury	Inorganic	mg/kg	3	2	2	1	1.7	ND	0.627	0.008	C
	Nickel	Inorganic	mg/kg	3	3	3	1	223	14.2	84.000	13.6	C
	Selenium	Inorganic	mg/kg	3	1	1	1	9.8	ND	3.537	0.028	C
	Silver	Inorganic	mg/kg	3	1	1	1	7.4	ND	2.533	4.04	C
	Benzo(a)pyrene	SVOC	mg/kg	3	1	1	-	2.1	ND	0.835	1.52	C
	Di-n-butyl phthalate	SVOC	mg/kg	3	1	1	-	0.55	ND	0.320	0.15	Q
SEDIMENT	Not Applicable											
SURFACE WATER	Not Applicable											
GROUND WATER	Not Applicable											

TABLE 3 - SUMMARY OF SWMU AND MEDIA SPECIFIC ECOLOGICAL RISK SCREENING RESULTS

Area/Media	Constituent: Compound	Type	Units	Summary of Analytical Data: Number of Samples[1]	Number of Values Exceeding PQL[2]	Number of Values Exceeding RESL[3]	Number of Values Exceeding Backgn	Concentration Range: Max.[4]	Min.[5]	Average[6]	RESLs[7]: Screening Conc.	SERA Status
SWMU 18												
SOIL	Copper	Inorganic	mg/kg	3	3	3	3	742	508	647.333	0.313	C
	Lead	Inorganic	mg/kg	3	3	3	1	64.7	20.6	38.867	0.46	C
	Mercury	Inorganic	mg/kg	3	3	3	3	84.7	3.3	30.733	0.008	C
	Selenium	Inorganic	mg/kg	3	3	3	3	2.3	2	2.133	0.028	C
	Zinc	Inorganic	mg/kg	3	3	3	3	7500	3800	5446.667	6.6	C
	Benzo(a)pyrene	SVOC	mg/kg	3	3	1	-	1.9	0.25	0.960	1.52	C
	Di-n-butyl phthalate	SVOC	mg/kg	3	1	1	-	5.4	ND	2.008	0.15	C
SEDIMENT	Not Applicable											
SURFACE WATER	Not Applicable											
GROUND WATER	Cadmium	Inorganic	ug/l	1	1	1	-	1.3	1.3	1.300	0.66	C
	Bis(2-ethylhexyl)phthalate	SVOC	ug/l	1	1	1	-	15	15	15.000	2.1	C
SWMU 19												
SOIL	Di-n-butyl phthalate	SVOC	mg/kg	3	2	2	-	4.3	0.3	1.787	0.15	C
SEDIMENT	Arsenic	Inorganic	mg/kg	1	1	1	-	8.7	8.7	8.700	6	C
	Nickel	Inorganic	mg/kg	1	1	1	-	16.3	16.3	16.300	16	C
SURFACE WATER	Not Applicable											
GROUND WATER	Not Applicable											
SWMU 20												
SOIL	Antimony	Inorganic	mg/kg	5	1	1	1	10.6	ND	2.260	0.142	C
	Arsenic	Inorganic	mg/kg	5	5	2	2	15.8	0.97	6.934	5.7	C
	Chromium	Inorganic	mg/kg	5	5	5	1	193	4.4	49.960	0.4	C
	Copper	Inorganic	mg/kg	5	5	5	2	1270	3.8	335.460	0.313	C
	Lead	Inorganic	mg/kg	5	5	5	1	1330	2.5	276.820	0.46	C
	Mercury	Inorganic	mg/kg	5	3	3	1	0.83	ND	0.232	0.008	C
	Selenium	Inorganic	mg/kg	5	1	1	1	5	ND	1.320	0.028	C
	Silver	Inorganic	mg/kg	5	1	1	1	5.2	ND	1.120	4.04	C
	Zinc	Inorganic	mg/kg	5	5	5	2	3400	13.8	762.860	6.6	C
	Benzo(a)pyrene	SVOC	mg/kg	5	1	1	-	1.9	ND	0.471	1.52	C
	Bis(2-ethylhexyl)phthalate	SVOC	mg/kg	5	1	1	-	2	0.059	0.485	0.926	C
SEDIMENT	Not Applicable											
SURFACE WATER	Not Applicable											
GROUND WATER	Not Applicable											

TABLE 3 - SUMMARY OF SWMU AND MEDIA SPECIFIC ECOLOGICAL RISK SCREENING RESULTS

Area/Media	Constituent: Compound	Type	Units	Summary of Analytical Data: Number of Samples[1]	Number of Values Exceeding PQL[2]	Number of Values Exceeding RESL[3]	Number of Values Exceeding Backgn	Concentration Range: Max.[4]	Min.[5]	Average[6]	RESLs[7]: Screening Conc.	SERA Status
SWMU 22												
SOIL	2,4-Dinitrotoluene	Explosive	mg/kg	3	1	1	-	7	ND	2.480	1.28	C
	2,6-Dinitrotoluene	Explosive	mg/kg	3	1	1	-	0.37	ND	0.270	0.033	C
	Antimony	Inorganic	mg/kg	3	3	3	2	12.7	1.2	6.467	0.142	C
	Arsenic	Inorganic	mg/kg	3	3	3	2	23.6	5.7	15.067	5.7	C
	Copper	Inorganic	mg/kg	3	3	3	2	158	52.3	116.100	0.313	C
	Lead	Inorganic	mg/kg	3	3	3	3	834	105	366.667	0.46	C
	Mercury	Inorganic	mg/kg	3	3	3	3	2.5	0.79	1.497	0.008	C
	Nickel	Inorganic	mg/kg	3	3	3	1	55	17.2	34.933	13.6	C
	Selenium	Inorganic	mg/kg	3	1	1	1	7.3	ND	2.635	0.028	C
	Zinc	Inorganic	mg/kg	3	3	3	3	1210	220	641.667	6.6	C
	Di-n-butyl phthalate	SVOC	mg/kg	3	2	2	-	6.2	ND	2.433	0.15	C
	N-Nitrosodiphenylamine	SVOC	mg/kg	3	1	1	-	1.6	ND	0.680	0.646	C
SEDIMENT	Not Applicable											
SURFACE WATER	Not Applicable											
GROUND WATER	Not Applicable											
SWMU 23												
SOIL	2,4-Dinitrotoluene	Explosive	mg/kg	3	1	1	-	6.4	ND	2.608	1.28	C
	2,6-Dinitrotoluene	Explosive	mg/kg	3	1	1	-	1.2	ND	0.483	0.033	C
	Benzo(a)anthracene	SVOC	mg/kg	3	2	2	-	20	9.3	14.650	5.21	C
	Benzo(a)pyrene	SVOC	mg/kg	3	2	2	-	16	7.4	11.700	1.52	C
	Chrysene	SVOC	mg/kg	3	2	2	-	24	9.8	16.900	4.73	C
SEDIMENT	Not Applicable											
SURFACE WATER	Not Applicable											
GROUND WATER	Not Applicable											
SWMU 25												
SOIL	Arsenic	Inorganic	mg/kg	3	3	3	1	14	6.6	9.133	5.7	C
	Copper	Inorganic	mg/kg	3	3	3	1	99.2	24	60.433	0.313	C
	Lead	Inorganic	mg/kg	3	3	3	2	247	44.4	151.800	0.46	C
	Selenium	Inorganic	mg/kg	3	2	2	2	1.3	ND	0.930	0.028	C
	Zinc	Inorganic	mg/kg	3	3	3	2	429	96.1	289.700	6.6	C
	Di-n-butyl phthalate	SVOC	mg/kg	3	2	1	-	1.2	ND	0.481	0.15	Q
SEDIMENT	Not Applicable											
SURFACE WATER	Not Applicable											
GROUND WATER	Not Applicable											

TABLE 3 - SUMMARY OF SWMU AND MEDIA SPECIFIC ECOLOGICAL RISK SCREENING RESULTS

Area/Media	Constituent Compound	Type	Units	Summary of Analytical Data: Number of Samples[1]	Number of Values Exceeding PQL[2]	Number of Values Exceeding RESL[3]	Number of Values Exceeding Backgn	Concentration Range Max.[4]	Concentration Range Min.[5]	Average[6]	RESLs[7] Screening Conc.	SERA Status
BALLISTIC SANDS												
SOIL	Copper	Inorganic	mg/kg	5	5	5	1	131	8.4	52.140	0.313	C
	Mercury	Inorganic	mg/kg	5	3	3	1	1.5	ND	0.432	0.008	C
	Selenium	Inorganic	mg/kg	5	3	3	3	2.4	ND	1.099	0.028	C
	Zinc	Inorganic	mg/kg	5	5	5	2	296	32.5	140.640	6.6	C
SEDIMENT	Not Applicable											
SURFACE WATER	Not Applicable											
GROUND WATER	Not Applicable											

Prepared by: RAC 6/22/98
Checked by: MCC 6/22/98
Revised by: BHB 7/21/99
Checked by: JPL 7/21/99

NOTES:

1 Number of Samples - The SWMU and media specific number of samples analyzed for the subject constituent

2 Number of Values Exceeding PQL - The SWMU and media specific number of analytical results exceeding the practical quantification limit (PQL) for the subject constituent

3 Number of Values Exceeding RESL - The SWMU and media specific number of analytical results exceeding the recommended ecological screening level RESL for the subject constituent

4 Max. - The SWMU and media specific maximum value reported for the subject constituent

5 Min. - The SWMU and media specific minimum value reported for the subject constituent (ND reported when the constituent was not detected within the subject SWMU and media)

6 Average - Arithmetic mean of SWMU and media specific values reported for the subject constituent.

Notes:
a. One half detection limit used for samples where subject constituent was not detected
b. Reported value used in average calculations when the data was "J" qualified to indicate that the result was below the sample specific PQL
c. The maximum SWMU, media and constituent specific value is reported as the average where the average calculated using one half of appropriate detection limits exceeds the maximum concentration

7 RESL - Media and constituent specific recommended ecological screening level

SERA Status Key:

C - Constituent retained as constituents of ecological concern (COECs) for subsequent phases of the ERA process.
R1.0 - SWMU and media specific average exceeds the RESL, however, based on additional evaluation, the constituent is not included in recommendations for further ecological evaluation or assessment.
Q - Laboratory data is not useable based on laboratory or data validation qualifications

TABLE 4 - SUMMARY OF SWMU AND MEDIA SPECIFIC CONSTITUENTS OF ECOLOGICAL CONCERN (COECs)

	MEDIA			
SWMU	Soil	Sediment	Surface Water	Groundwater
1	Copper Lead Selenium Zinc Benzo(a)anthracene Benzo(a)pyrene Chrysene	Not Applicable	Not Applicable	Not Applicable
2	Arsenic Chromium Copper Mercury Nickel Selenium Zinc Bis(2-ethylhexyl)phthalate	Not Applicable	Not Applicable	Not Applicable
3&4	2,4-Dinitrotoluene 2,6-Dinitrotoluene Antimony Arsenic Barium Cadmium Chromium Copper Lead Mercury Nickel Selenium Silver Zinc Benzo(a)anthracene Benzo(a)pyrene Bis(2-ethylhexyl)phthalate Chrysene Di-n-butyl phthalate N-Nitrosodiphenylamine	Not Applicable	Not Applicable	Cadmium Bis(2-ethylhexyl)phthalate Vinyl chloride
5	2,4-Dinitrotoluene 2,6-Dinitrotoluene Cadmium Copper Cyanide Lead Mercury Nickel Selenium Zinc	Arsenic Nickle	Not Applicable	No RESL Exceedances
6	Antimony Arsenic Barium Cadmium Chromium Copper Cyanide Lead Mercury Nickel Selenium Silver Zinc N-Nitrosodiphenylamine	Arsenic Copper Cyanide Nickle Zinc	No RESL Exceedances	Not Applicable
7A	Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Chrysene Fluoranthene Phenanthrene Pyrene	2,4-Dinitrotoluene Benzo(a)anthracene Benzo(a)pyrene Benzo(g,h,I)perylene Chrysene Diethyl phthalate Di-n-butyl phthalate Fluoranthene Indeno(1,2,3-cd)pyrene N-Nitrosodiphenylamine	Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Benzo(k)fluoranthene Chrysene	Not Applicable

TABLE 4 - SUMMARY OF SWMU AND MEDIA SPECIFIC CONSTITUENTS OF ECOLOGICAL CONCERN (COECs)

	MEDIA			
SWMU	Soil	Sediment	Surface Water	Groundwater
7B	Naphthalane N-Nitrosodiphenylamine	o,p'-DDT	Not Applicable	Not Applicable
8	Not Applicable	No COECs retained	Not Applicable	Not Applicable
9A	Not Applicable	2,4-Dinitrotoluene 2,6-Dinitrotoluene Di-n-butyl phthalate N-Nitrosodiphenylamine	No RESL Exceedances	Not Applicable
9B	Not Applicable	N-Nitrosodiphenylamine	Not Applicable	Not Applicable
9C	Not Applicable	2,4-Dinitrotoluene 2,6-Dinitrotoluene Di-n-butyl phthalate N-Nitrosodiphenylamine	No RESL Exceedances	Not Applicable
9D	Not Applicable	2,4-Dinitrotoluene 2,6-Dinitrotoluene Di-n-butyl phthalate N-Nitrosodiphenylamine Diphenylamine	Not Applicable	Not Applicable
11	No COECs retained	No RESL Exceedances	Not Applicable	Not Applicable
12	2,6-Dinitrotoluene Arsenic Copper Lead Zinc Di-n-butyl phthalate	Not Applicable	Not Applicable	Not Applicable
13	2,4-Dinitrotoluene 2,6-Dinitrotoluene Mercury Zinc Di-n-butyl phthalate N-Nitrosodiphenylamine	Not Applicable	Not Applicable	Not Applicable
14	Arsenic Lead Mercury Selenium Zinc Bis(2ethylhexyl)phthalate Di-n-butyl phthalate	Arsenic Copper Mercury	Not Applicable	Not Applicable
15A	Not Applicable	Arsenic Cadmium Chromium Copper Cyanide Lead Mercury Nickle Zinc Acenaphthene Bis(2-ethylhexyl)phthalate Di-n-butyl phthalate Flouranthene Fluorene Phenanthrene	Copper Lead Zinc Chloroform	Not Applicable
15B	Not Applicable	Not Applicable	Copper Lead	Lead
16	2,4-Dinitrotoluene 2,6-Dinitrotoluene Bis(2ethylhexyl)phthalate Di-n-butyl phthalate N-Nitrosodiphenylamine	Not Applicable	Not Applicable	Not Applicable

TABLE 4 - SUMMARY OF SWMU AND MEDIA SPECIFIC CONSTITUENTS OF ECOLOGICAL CONCERN (COECs)

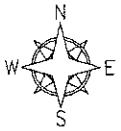
	MEDIA			
SWMU	Soil	Sediment	Surface Water	Groundwater
17	Antimony Arsenic Cadmium Chromium Copper Lead Mercury Nickle Selenium Silver Benzo(a)pyrene	Not Applicable	Not Applicable	Not Applicable
18	Copper Lead Mercury Selenium Zinc Benzo(a)pyrene Di-in-butyl phthalate	Not Applicable	Not Applicable	Cadmium Bis(2-ethylhexyl)phthalate
19	Di-in-butyl phthalate	Arsnenic Nickle	Not Applicable	Not Applicable
20	Antimony Arsenic Chromium Copper Lead Mercury Selenium Silver Zinc Benzo(a)pyrene Bis(2ethylhexyl)phthalate	Not Applicable	Not Applicable	Not Applicable
22	2,4-Dinitrotoluene 2,6-Dinitrotoluene Antimony Arsenic Copper Lead Mercury Nickel Selenium Zinc Di-n-butyl phthalate N-Nitrosodiphenylamine	Not Applicable	Not Applicable	Not Applicable
23	2,4 Dinitrotoluene 2,6 Dinitrotoluene Benzo(a)anthracene Benzo(a)pyrene Chrysene	Not Applicable	Not Applicable	Not Applicable
25	Arsenic Copper Lead Selenium Zinc	Not Applicable	Not Applicable	Not Applicable
Ballistic	Copper Mercury Selenium Zinc	Not Applicable	Not Applicable	Not Applicable

Prepared by: RAC 6/22/98
Checked by: MCC 6/22/98
Revised by: BHB 7/21/99
Checked by: JPL 7/21/99

FIGURES

SOURCE:
U.S. Geological Survey
Alton ILL.–MO. Quadrangle 1994, Bethalo, ILL. Quadrangle (1954) Revised 1993,
Columbia Bottom, MO.–ILL. Quadrangle 1994 & Wood River, ILL.–MO. Quadrangle 1994
7.5 Minute Series (Topographic)

QUADRANGLE LOCATION



0 0.5 1.0
APPROXIMATE SCALE IN MILES

0 1000 2000 3000 4000 5000
APPROXIMATE SCALE IN FEET

REVISION	DESCRIPTION	DATE	APPROVED	MADE

REVISIONS

	BY	DATE		BY	DATE
DESIGNED:			DRAWN:	U.S.G.S.	1993+1994
CHECKED:			CADD FILE:	48512-1	06/19/98
APPROVED:					

PREPARED BY: ADVENT

PREPARED FOR: OLIN BRASS AND WINCHESTER, INC.
MAIN PLANT FACILITY
EAST ALTON, ILLINOIS

SITE LOCATION MAP

SCALE	PROJECT NUMBER	FIGURE NUMBER	REVISION
AS SHOWN	48512	1	–

APPENDIX A

SUMMARY OF ECOLOGICAL SCREENING LEVELS (ESLS)

Appendix A - Summary of Ecological Screening Levels (ESLs)

	PARAMETER			ORNL PRGEE[1]		Region V - Pre 5/98[2]		Region V - Current[3]		USEPA OSWER ET[4]		Region IV ESV[5]		USEPA OST WQCSC[6]		Background Data[7]		Recommended ESLs			
MEDIA	PARAMETER	CAS No.	Units	conc	receptor	min	max	conc	receptor	conc	receptor	conc	receptor	conc	receptor	lower	upper	Screening Conc.	Source	Justification	Comments
SOIL										-											
	1-(2-Butoxyethoxy)ethanol	54446-78-5	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	1,1,1-Trichloroethane	71-55-6	mg/Kg	-	-	0.1	7000	29.8	-	-	-	-	-	-	-	-	-	7000	3	REG-V	
	1-Methyl naphthalene	90-12-0	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	2-(2-Butoxyethoxy) ethanol	112-34-5	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	2-(2-Ethoxyethoxy)ethanol	111-90-0	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	2-(2-Methoxyethoxy)ethanol	111-77-3	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	2,4,6-Trinitrotoluene	118-96-7	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	2,4-Dinitrotoluene	121-14-2	mg/Kg	-	-	100	100	1.28	-	-	-	-	-	-	-	-	-	1.28	3	REG-V	receptor: shrew, ATSDR, rat study
	2,6-Dinitrotoluene	606-20-2	mg/Kg	-	-	1	1	0.033	-	-	-	-	-	-	-	-	-	0.033	3	REG-V	receptor: shrew, ATSDR, dog study
	2,6-Di-tert-butyl-4-methyl phenol	128-37-0	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	2-Butanone	78-93-3	mg/Kg	-	-	10000	10000	89.6	-	-	-	-	-	-	-	-	-	89.6	3	REG-V	
	2-Methylnaphthalene	91-57-6	mg/Kg	-	-	1	1	3.24	-	-	-	-	-	-	-	-	-	3.24	3	REG-V	
	2-Methylphenol	95-48-7	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	2-n-Butoxyethanol	111-76-2	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	2-Nitrotoluene	88-72-2	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	2-Phenoxyethanol	122-99-6	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	3-Nitrotoluene	99-08-1	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	4-Chloroaniline	106-47-8	mg/Kg	20	plant	-	-	1.1	-	-	-	-	-	-	-	-	-	1.1	3	REG-V	
	4-Methylphenol	106-44-5	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	4-Nitrophenol	100-02-7	mg/Kg	7	earthworm	0.02	20	6.12	-	-	-	-	-	-	-	-	-	6.12	3	REG-V	
	4-Nitrotoluene	99-99-0	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	9,10-Anthraquinone	84-65-1	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Acenaphthene	83-32-9	mg/Kg	20	plant	1	20000	682	-	-	-	-	-	-	-	-	-	682	3	REG-V	
	Acenaphthylene	208-96-8	mg/Kg	-	-	10	10	682	-	-	-	-	-	-	-	-	-	682	3	REG-V	
	Acetone	67-64-1	mg/Kg	-	-	10000	10000	2.5	-	-	-	-	-	-	-	-	-	2.5	3	REG-V	
	Acetophenone	98-86-2	mg/Kg	-	-	100	100	300	-	-	-	-	-	-	-	-	-	300	3	REG-V	
	Ammonia (as N)	7664-41-7	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Anthracene	120-12-7	mg/Kg	-	-	0.1	80000	1460	-	-	-	-	-	-	-	-	-	1460	3	REG-V	
	Antimony	7440-36-0	mg/Kg	5	plant	4.5	500	0.142	-	-	-	-	-	-	-	-	2.15	0.142	3	REG-V	Reg V: shrew; ORNL: unspecified
	Arsenic	7440-38-2	mg/Kg	9.9	shrew	0.4	500	5.7	-	-	-	-	-	-	-	4.1	10	5.7	3	REG-V	receptor: shrew, ATSDR, LOEL
	Azobenzene	103-33-3	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Barium	7440-39-3	mg/Kg	283	woodcock	100	20000	1.04	-	-	-	-	-	-	-	300	700	1.04	3	REG-V	receptor: shrew
	Benzenamine, 2-nitro- N-phenyl	119-75-5	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Benzenamine, 4-nitro- N-phenyl	836-30-6	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Benzene	71-43-2	mg/Kg	-	-	0.01	100	0.255	-	-	-	-	-	-	-	-	-	0.255	3	REG-V	
	Benzenesulfonamide, 2-methyl	88-19-7	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Benzo(a)anthracene	56-55-3	mg/Kg	-	-	0.1	1	5.21	-	-	-	-	-	-	-	-	-	5.21	3	REG-V	receptor: shrew, Fish & Wild., rodent
	Benzo(a)pyrene	50-32-8	mg/Kg	-	-	0.02	1	1.52	-	-	-	-	-	-	-	-	-	1.52	3	REG-V	receptor: shrew, ATSDR, mouse NOELs
	Benzo(b)fluoranthene	205-99-2	mg/Kg	-	-	0.1	0.1	59.8	-	-	-	-	-	-	-	-	-	59.8	3	REG-V	receptor: shrew
	Benzo(g,h,i)perylene	191-24-2	mg/Kg	-	-	1	1	119	-	-	-	-	-	-	-	-	-	119	3	REG-V	
	Benzo(k)fluoranthene	207-08-9	mg/Kg	-	-	0.1	0.1	148	-	-	-	-	-	-	-	-	-	148	3	REG-V	
	Benzoic acid	65-85-0	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Bis(2-chloroethyl)ether	111-44-4	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Bis(2-ethylhexyl)phthalate	117-81-7	mg/Kg	-	-	50	50	0.926	-	-	-	-	-	-	-	-	-	0.926	3	REG-V	receptor: shrew, IRIS, HSDB, studies
	Butyl benzyl phthalate	85-68-7	mg/Kg	-	-	10000	10000	0.239	-	-	-	-	-	-	-	-	-	0.239	3	REG-V	
	Cadmium	7440-43-9	mg/Kg	-	-	0.08	100	0.181	-	-	-	-	-	-	-	1	4	0.181	3	REG-V	receptor: shrew
	Carbazole	86-74-8	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

Appendix A - Summary of Ecological Screening Levels (ESLs)

	PARAMETER			ORNL PRGEE[1]		Region V - Pre 5/98[2]		Region V - Current[3]		USEPA OSWER ET[4]		Region IV ESV[5]		USEPA OST WQCSC[6]		Background Data[7]		Recommended ESLs			
MEDIA	PARAMETER	CAS No.	Units	conc	receptor	min	max	conc	receptor	conc	receptor	conc	receptor	conc	receptor	lower	upper	Screening Conc.	Source	Justification	Comments
	Carbon disulfide	75-15-0	mg/Kg	-	-	-	-	0.094	-	-	-	-	-	-	-	-	-	0.094	3	REG-V	
	Chloroform	67-66-3	mg/Kg	-	-	0.1	100	1.19	-	-	-	-	-	-	-	-	-	1.19	3	REG-V	
	Chromium	7440-47-3	mg/Kg	0.4	earthworm	0.05	2500	0.4	-	-	-	-	-	-	-	30	70	0.4	3	REG-V	receptor: shrew
	Chrysene	218-01-9	mg/Kg	-	-	0.1	1	4.73	-	-	-	-	-	-	-	-	-	4.73	3	REG-V	receptor: shrew, Fish & Wild., rodent
	Copper	7440-50-8	mg/Kg	60	earthworm	2	10000	0.313	-	-	-	-	-	-	-	7	75	0.313	3	REG-V	receptor: plant, Canadian study, barley
	Cyanide	57-12-5	mg/Kg	-	-	0.05	5	1.33	-	-	-	-	-	-	-	-	-	1.33	3	REG-V	receptor: shrew
	Cyclohexane, methyl-	108-87-2	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Dibenz(a,h)anthracene	53-70-3	mg/Kg	-	-	0.1	1	18.4	-	-	-	-	-	-	-	-	-	18.4	3	REG-V	
	Dibenzofuran	132-64-9	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Dibenzofuran, 4-methyl-	7320-53-8	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Dibenzothiophene	132-65-0	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Diethyl ether	60-29-7	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Diethyl phthalate	84-66-2	mg/Kg	100	plant	0.06	0.06	24.8	-	-	-	-	-	-	-	-	-	24.8	3	REG-V	
	Diisobutyl phthalate	84-69-5	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Di-n-butyl phthalate	84-74-2	mg/Kg	200	plant	0.08	0.08	0.15	-	-	-	-	-	-	-	-	-	0.15	3	REG-V	receptor: shrew
	Diphenylamine	122-39-4	mg/Kg	-	-	-	-	1.01	-	-	-	-	-	-	-	-	-	1.01	3	REG-V	
	Ethylbenzene	100-41-4	mg/Kg	-	-	0.05	15000	5.16	-	-	-	-	-	-	-	-	-	5.16	3	REG-V	
	Fluoranthene	206-44-0	mg/Kg	-	-	0.1	10000	122	-	-	-	-	-	-	-	-	-	122	3	REG-V	receptor: shrew
	Fluorene	86-73-7	mg/Kg	-	-	10	10000	122	-	-	-	-	-	-	-	-	-	122	3	REG-V	
	Furan, 2-methoxy-	25414-22-6	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Hexanoic acid	142-62-1	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	HMX	2691-41-0	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Hydrazine, 1,1-diphenyl-	530-50-7	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Indeno(1,2,3-cd)pyrene	193-39-5	mg/Kg	-	-	0.1	1	109	-	-	-	-	-	-	-	-	-	109	3	REG-V	
	Lead	7439-92-1	mg/Kg	40.5	woodcock	10	1000	0.46	-	-	-	-	-	-	-	10	60	0.46	3	REG-V	receptor: shrew, HSDB, LOEL
	Mercury	7439-97-6	mg/Kg	0.00051	woodcock	0.002	80	0.008	-	-	-	-	-	-	-	0.051	0.51	0.008	3	REG-V	receptor: earthworm, Fish & Wild.
	Methylene chloride	75-09-2	mg/Kg	-	-	0.1	0.1	4.06	-	-	-	-	-	-	-	-	-	4.06	3	REG-V	
	Naphthalene	91-20-3	mg/Kg	-	-	5	5	0.099	-	-	-	-	-	-	-	-	-	0.099	3	REG-V	receptor: shrew
	n-Decane	124-18-5	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Nickel	7440-02-0	mg/Kg	30	plant	0.04	5000	13.6	-	-	-	-	-	-	-	8.5	40	13.6	3	REG-V	receptor: shrew, HSDB, rat NOEL
	Nitrocellulose	#N/A	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Nitrogen, Total Kjeldahl	10-07-1	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Nitroglycerin	55-63-0	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	N-Nitrosodiphenylamine	86-30-6	mg/Kg	-	-	-	-	0.646	-	-	-	-	-	-	-	-	-	0.646	3	REG-V	receptor: shrew
	o,p'-DDT	789-02-6	mg/Kg	-	-	0.1	2	0.018	-	-	-	-	-	-	-	-	-	0.018	3	REG-V	
	Pentanal, 5-hydroxy-, (2,4-d...	3638-33-3	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Phenanthrene	85-01-8	mg/Kg	-	-	0.1	5	46.7	-	-	-	-	-	-	-	-	-	46.7	3	REG-V	receptor: shrew
	Phenol	108-95-2	mg/Kg	30	earthworm	0.02	20	120	-	-	-	-	-	-	-	-	-	120	3	REG-V	
	Prometon	1610-18-0	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Pyrene	129-00-0	mg/Kg	-	-	0.1	8000	78.6	-	-	-	-	-	-	-	-	-	78.6	3	REG-V	receptor: shrew
	Quinoline, 2-methyl-	91-63-4	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	RDX	121-82-4	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Selenium	7782-49-2	mg/Kg	0.21	mouse	3	100000	0.028	-	-	-	-	-	-	-	0.3	1	0.028	3	REG-V	receptor: shrew, ATSDR, rat LOEL
	Silver	7440-22-4	mg/Kg	2	plant	20	1500	4.04	-	-	-	-	-	-	-	0.7	5	4.04	3	REG-V	receptor: shrew
	Solids, Total (TS) SOLID MATRIX	10-31-1	%	-	-	20	1500	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Tetryl	479-45-8	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

Appendix A - Summary of Ecological Screening Levels (ESLs)

	PARAMETER			ORNL PRGEE[1]		Region V - Pre 5/98[2]		Region V - Current[3]		USEPA OSWER ET[4]		Region IV ESV[5]		USEPA OST WQCSC[6]		Background Data[7]		Recommended ESLs			
MEDIA	PARAMETER	CAS No.	Units	conc	receptor	min	max	conc	receptor	conc	receptor	conc	receptor	conc	receptor	lower	upper	Screening Conc.	Source	Justification	Comments
	Toluene	108-88-3	mg/Kg	200	plant	0.05	5000	5.45	-	-	-	-	-	-	-	-	-	5.45	3	REG-V	
	Trichloroethene	79-01-6	mg/Kg	-	-	0.1	2040	12.4	-	-	-	-	-	-	-	-	-	12.4	3	REG-V	
	Trichlorofluoromethane	75-69-4	mg/Kg	-	-	0.1	1000	16.4	-	-	-	-	-	-	-	-	-	16.4	3	REG-V	
	Xylenes	1330-20-7	mg/Kg	-	-	0.05	2000	10	-	-	-	-	-	-	-	-	-	10	3	REG-V	
	Zinc	7440-66-6	mg/Kg	8.5	woodcock	4	5000	6.6	-	-	-	-	-	-	-	28	120	6.6	3	REG-V	receptor: earthworm, Fish & Wild.
SEDIMENT																					
	1-(2-Butoxyethoxy)ethanol	54446-78-5	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	1,1,1-Trichloroethane	71-55-6	mg/Kg	9.6	-	-	-	0.247	-	0.17	-	-	-	-	-	-	-	0.247	3	REG-V	
	1-Methyl naphthalene	90-12-0	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	2-(2-Butoxyethoxy) ethanol	112-34-5	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	2-(2-Ethoxyethoxy)ethanol	111-90-0	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	2-(2-Methoxyethoxy)ethanol	111-77-3	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	2,4,6-Trinitrotoluene	118-96-7	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	2,4-Dinitrotoluene	121-14-2	mg/Kg	-	-	-	-	0.075	-	-	-	-	-	-	-	-	-	0.075	3	REG-V	calculated based on Koc and Sed Q.C.
	2,6-Dinitrotoluene	606-20-2	mg/Kg	-	-	-	-	0.021	-	-	-	-	-	-	-	-	-	0.021	3	REG-V	calculated based on Koc and Sed Q.C.
	2,6-Di-tert-butyl-4-methyl phenol	128-37-0	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	2-Butanone	78-93-3	mg/Kg	0.27	-	-	-	0.502	-	-	-	-	-	-	-	-	-	0.502	3	REG-V	
	2-Methylnaphthalene	91-57-6	mg/Kg	-	-	-	-	0.02	-	-	-	330	-	-	-	-	-	0.02	3	REG-V	
	2-Methylphenol	95-48-7	mg/Kg	0.012	-	-	-	-	-	-	-	-	-	-	-	-	-	0.012	1	ORNL	
	2-n-Butoxyethanol	111-76-2	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	2-Nitrotoluene	88-72-2	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	2-Phenoxyethanol	122-99-6	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	3-Nitrotoluene	99-08-1	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	4-Chloroaniline	106-47-8	mg/Kg	-	-	-	-	0.145	-	-	-	-	-	-	-	-	-	0.145	3	REG-V	
	4-Methylphenol	106-44-5	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	4-Nitrophenol	100-02-7	mg/Kg	-	-	-	-	0.008	-	-	-	-	-	-	-	-	-	0.008	3	REG-V	
	4-Nitrotoluene	99-99-0	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	9,10-Anthraquinone	84-65-1	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Acenaphthene	83-32-9	mg/Kg	0.089	-	-	-	0.007	-	0.62	-	330	-	-	-	-	-	0.007	3	REG-V	
	Acenaphthylene	208-96-8	mg/Kg	0.13	-	-	-	0.006	-	-	-	330	-	-	-	-	-	0.006	3	REG-V	
	Acetone	67-64-1	mg/Kg	0.0091	-	-	-	0.704	-	-	-	-	-	-	-	-	-	0.704	3	REG-V	
	Acetophenone	98-86-2	mg/Kg	-	-	-	-	0.246	-	-	-	-	-	-	-	-	-	0.246	3	REG-V	
	Ammonia (as N)	7664-41-7	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Anthracene	120-12-7	mg/Kg	0.25	-	-	-	0.047	-	4	-	330	-	-	-	-	-	0.047	3	REG-V	
	Antimony	7440-36-0	mg/Kg	-	-	-	-	-	-	-	-	12	-	-	-	-	-	12	5	MAV	
	Arsenic	7440-38-2	mg/Kg	42	-	-	-	6	-	8.2	-	7.24	-	-	-	-	-	6	3	REG-V	Ontario Min. of Env. criteria
	Azobenzene	103-33-3	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Barium	7440-39-3	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Benzenamine, 2-nitro- N-phenyl	119-75-5	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Benzenamine, 4-nitro- N-phenyl	836-30-6	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Benzene	71-43-2	mg/Kg	0.16	-	-	-	0.142	-	0.057	-	-	-	-	-	-	-	0.142	3	REG-V	
	Benzenesulfonamide, 2-methyl	88-19-7	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Benzo(a)anthracene	56-55-3	mg/Kg	0.69	-	-	-	0.032	-	4	-	330	-	-	-	-	-	0.032	3	REG-V	Env. Canada; Ontartio 0.32
	Benzo(a)pyrene	50-32-8	mg/Kg	0.394	-	-	-	0.032	-	0.43	-	330	-	-	-	-	-	0.032	3	REG-V	Env. Canada; Ontartio 0.37
	Benzo(b)fluoranthene	205-99-2	mg/Kg	4	-	-	-	10.4	-	4	-	-	-	-	-	-	-	10.4	3	REG-V	
	Benzo(g,h,i)perylene	191-24-2	mg/Kg	6.3	-	-	-	0.17	-	4	-	-	-	-	-	-	-	0.17	3	REG-V	
	Benzo(k)fluoranthene	207-08-9	mg/Kg	-	-	-	-	0.24	-	4	-	-	-	-	-	-	-	0.24	3	REG-V	

Appendix A - Summary of Ecological Screening Levels (ESLs)

	PARAMETER			ORNL PRGEE[1]		Region V - Pre 5/98[2]		Region V - Current[3]		USEPA OSWER ET[4]		Region IV ESV[5]		USEPA OST WQCSC[6]		Background Data[7]		Recommended ESLs			
MEDIA	PARAMETER	CAS No.	Units	conc	receptor	min	max	conc	receptor	conc	receptor	conc	receptor	conc	receptor	lower	upper	Screening Conc.	Source	Justification	Comments
	Benzoic acid	65-85-0	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Bis(2-chloroethyl)ether	111-44-4	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Bis(2-ethylhexyl)phthalate	117-81-7	mg/Kg	2.7	-	-	-	0.182	-	-	-	182	-	-	-	-	-	0.182	3	REG-V	Environmental Canada
	Butyl benzyl phthalate	85-68-7	mg/Kg	-	-	-	-	0.257	-	11	-	-	-	-	-	-	-	0.257	3	REG-V	
	Cadmium	7440-43-9	mg/Kg	4.2	-	-	-	0.6	-	1.2	-	1	-	-	-	-	-	0.6	3	REG-V	
	Carbazole	86-74-8	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Carbon disulfide	75-15-0	mg/Kg	0.00086	-	-	-	0.134	-	-	-	-	-	-	-	-	-	0.134	3	REG-V	
	Chloroform	67-66-3	mg/Kg	0.96	-	-	-	0.027	-	-	-	-	-	-	-	-	-	0.027	3	REG-V	
	Chromium	7440-47-3	mg/Kg	159	-	-	-	26	-	81	-	52.3	-	-	-	-	-	26	3	REG-V	
	Chrysene	218-01-9	mg/Kg	0.85	-	-	-	0.057	-	4	-	330	-	-	-	-	-	0.057	3	REG-V	Env. Canada; Ontartio 0.34
	Copper	7440-50-8	mg/Kg	77.7	-	-	-	16	-	34	-	18.7	-	-	-	-	-	16	3	REG-V	Ontario Min. of Env. criteria
	Cyanide	57-12-5	mg/Kg	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	0.1	3	REG-V	
	Cyclohexane, methyl-	108-87-2	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Dibenz(a,h)anthracene	53-70-3	mg/Kg	0.0282	-	-	-	0.006	-	4	-	330	-	-	-	-	-	0.006	3	REG-V	
	Dibenzofuran	132-64-9	mg/Kg	0.42	-	-	-	1.5	-	2	-	-	-	-	-	-	-	1.5	3	REG-V	
	Dibenzofuran, 4-methyl-	7320-53-8	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Dibenzothiophene	132-65-0	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Diethyl ether	60-29-7	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Diethyl phthalate	84-66-2	mg/Kg	0.61	-	-	-	0.008	-	0.63	-	-	-	-	-	-	-	0.008	3	REG-V	
	Diisobutyl phthalate	84-69-5	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Di-n-butyl phthalate	84-74-2	mg/Kg	240	-	-	-	0.111	-	11	-	-	-	-	-	-	-	0.111	3	REG-V	
	Diphenylamine	122-39-4	mg/Kg	-	-	-	-	0.035	-	-	-	-	-	-	-	-	-	0.035	3	REG-V	calculated based on Koc and Sed Q.C.
	Ethylbenzene	100-41-4	mg/Kg	5.4	-	-	-	0.0001	-	3.6	-	-	-	-	-	-	-	0.0001	3	REG-V	
	Fluoranthene	206-44-0	mg/Kg	0.834	-	-	-	0.111	-	2.9	-	-	-	-	-	-	-	0.111	3	REG-V	
	Fluorene	86-73-7	mg/Kg	0.14	-	-	-	0.021	-	0.54	-	330	-	-	-	-	-	0.021	3	REG-V	
	Furan, 2-methoxy-	25414-22-6	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Hexanoic acid	142-62-1	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	HMX	2691-41-0	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Hydrazine, 1,1-diphenyl-	530-50-7	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Indeno(1,2,3-cd)pyrene	193-39-5	mg/Kg	0.837	-	-	-	0.2	-	4	-	-	-	-	-	-	-	0.2	3	REG-V	
	Lead	7439-92-1	mg/Kg	110	-	-	-	31	-	47	-	30.2	-	-	-	-	-	31	3	REG-V	Ontario Min. of Env. criteria
	Mercury	7439-97-6	mg/Kg	0.7	-	-	-	0.2	-	0.15	-	0.13	-	-	-	-	-	0.2	3	REG-V	Env. Canada; Ontario 0.2
	Methylene chloride	75-09-2	mg/Kg	18	-	-	-	0.108	-	-	-	-	-	-	-	-	-	0.108	3	REG-V	
	Naphthalene	91-20-3	mg/Kg	0.39	-	-	-	0.035	-	0.48	-	330	-	-	-	-	-	0.035	3	REG-V	
	n-Decane	124-18-5	mg/Kg	41	-	-	-	-	-	-	-	-	-	-	-	-	-	41	1	ORNL	
	Nickel	7440-02-0	mg/Kg	38.5	-	-	-	16	-	21	-	15.9	-	-	-	-	-	16	3	REG-V	Ontario Min. of Env. criteria
	Nitrocellulose	#N/A	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Nitrogen, Total Kjeldahl	10-07-1	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Nitroglycerin	55-63-0	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	N-Nitrosodiphenylamine	86-30-6	mg/Kg	-	-	-	-	0.155	-	-	-	-	-	-	-	-	-	0.155	3	REG-V	
	o,p'-DDT	789-02-6	mg/Kg	0.052	-	-	-	0.001	-	0.0016	-	3.3	-	-	-	-	-	0.001	3	REG-V	
	Pentanal, 5-hydroxy-, (2,4-d...	3638-33-3	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Phenanthrene	85-01-8	mg/Kg	0.54	-	-	-	0.042	-	0.85	-	330	-	-	-	-	-	0.042	3	REG-V	
	Phenol	108-95-2	mg/Kg	0.032	-	-	-	0.027	-	-	-	-	-	-	-	-	-	0.027	3	REG-V	
	Prometon	1610-18-0	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Pyrene	129-00-0	mg/Kg	1.4	-	-	-	0.053	-	4	-	-	-	-	-	-	-	0.053	3	REG-V	

Appendix A - Summary of Ecological Screening Levels (ESLs)

	PARAMETER			ORNL PRGEE[1]		Region V - Pre 5/98[2]		Region V - Current[3]		USEPA OSWER ET[4]		Region IV ESV[5]		USEPA OST WQCSC[6]		Background Data[7]		Recommended ESLs			
MEDIA	PARAMETER	CAS No.	Units	conc	receptor	min	max	conc	receptor	conc	receptor	conc	receptor	conc	receptor	lower	upper	Screening Conc.	Source	Justification	Comments
	Quinoline, 2-methyl-	91-63-4	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	RDX	121-82-4	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Selenium	7782-49-2	mg/Kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Silver	7440-22-4	mg/Kg	1.8	-	-	-	0.5	-	-	-	2	-	-	-	-	-	0.5	3	REG-V	
	Solids, Total (TS) SOLID MATRIX	10-31-1	%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Toluene	108-88-3	mg/Kg	0.05	-	-	-	52.5	-	0.67	-	-	-	-	-	-	-	52.5	3	REG-V	
	Trichloroethene	79-01-6	mg/Kg	52	-	-	-	0.18	-	1.6	-	-	-	-	-	-	-	0.18	3	REG-V	
	Trichlorofluoromethane	75-69-4	mg/Kg	-	-	-	-	19.7	-	-	-	-	-	-	-	-	-	19.7	3	REG-V	
	Xylenes	1330-20-7	mg/Kg	0.16	-	-	-	1.9	-	0.025	-	-	-	-	-	-	-	1.9	3	REG-V	
	Zinc	7440-66-6	mg/Kg	270	-	-	-	120	-	150	-	124	-	-	-	-	-	120	3	REG-V	Ontario Min. of Env. criteria
WATER																					
	1-(2-Butoxyethoxy)ethanol	54446-78-5	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	1,1,1-Trichloroethane	71-55-6	ug/L	11	aquatic life	-	-	88	-	62	-	528	-	-	-	-	-	88	3	REG-V	
	1,2-Dichloroethene	540-59-0	ug/L	590	aquatic life	-	-	-	-	-	-	-	-	11600	-	-	-	590	1	ORNL	
	1-Methyl naphthalene	90-12-0	ug/L	2.1	aquatic life	-	-	-	-	-	-	-	-	-	-	-	-	2.1	1	ORNL	
	2-(2-Butoxyethoxy) ethanol	112-34-5	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	2-(2-Ethoxyethoxy)ethanol	111-90-0	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	2-(2-Methoxyethoxy)ethanol	111-77-3	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	2,4,6-Trinitrotoluene	118-96-7	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	2,4-Dinitrotoluene	121-14-2	ug/L	-	-	-	-	230	-	-	-	-	-	-	-	-	-	230	3	REG-V	
	2,6-Dinitrotoluene	606-20-2	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	2,6-Di-tert-butyl-4-methyl phenol	128-37-0	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	2-Butanone	78-93-3	ug/L	14000	aquatic life	-	-	7100	-	-	-	-	-	-	-	-	-	7100	3	REG-V	
	2-Methylnaphthalene	91-57-6	ug/L	-	-	-	-	330	-	-	-	-	-	-	-	-	-	330	3	REG-V	
	2-Methylphenol	95-48-7	ug/L	13	aquatic life	-	-	-	-	-	-	-	-	-	-	-	-	13	1	ORNL	
	2-n-Butoxyethanol	111-76-2	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	2-Nitrotoluene	88-72-2	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	2-Phenoxyethanol	122-99-6	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	3-Nitrotoluene	99-08-1	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	4-Chloroaniline	106-47-8	ug/L	-	-	-	-	232	-	-	-	-	-	-	-	-	-	232	3	REG-V	
	4-Methylphenol	106-44-5	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	4-Nitrophenol	100-02-7	ug/L	300	aquatic life	-	-	35	-	-	-	-	-	-	-	-	-	35	3	REG-V	
	4-Nitrotoluene	99-99-0	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	9,10-Anthraquinone	84-65-1	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Acenaphthene	83-32-9	ug/L	23	aquatic life	-	-	9.9	-	23	-	17	-	520	-	-	-	9.9	3	REG-V	
	Acenaphthylene	208-96-8	ug/L	-	-	-	-	4840	-	-	-	-	-	-	-	-	-	4840	3	REG-V	
	Acetone	67-64-1	ug/L	1500	aquatic life	-	-	78000	-	-	-	-	-	-	-	-	-	78000	3	REG-V	
	Acetophenone	98-86-2	ug/L	-	-	-	-	687.9	-	-	-	-	-	-	-	-	-	687.9	3	REG-V	
	Ammonia (as N)	7664-41-7	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Anthracene	120-12-7	ug/L	0.73	aquatic life	-	-	0.029	-	-	-	-	-	-	-	-	-	0.029	3	REG-V	
	Antimony	7440-36-0	ug/L	30	aquatic life	-	-	31	-	-	-	160	-	30	-	-	-	31	3	REG-V	
	Arsenic	7440-38-2	ug/L	3.1	aquatic life	-	-	53	-	8.1	-	90	-	190	-	-	-	53	3	REG-V	
	Azobenzene	103-33-3	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Barium	7440-39-3	ug/L	4	aquatic life	-	-	5000	-	3.9	-	-	-	-	-	-	-	5000	3	REG-V	
	Benzenamine, 2-nitro- N-phenyl	119-75-5	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

Appendix A - Summary of Ecological Screening Levels (ESLs)

	PARAMETER			ORNL PRGEE[1]		Region V - Pre 5/98[2]		Region V - Current[3]		USEPA OSWER ET[4]		Region IV ESV[5]		USEPA OST WQCSC[6]		Background Data[7]		Recommended ESLs			
MEDIA	PARAMETER	CAS No.	Units	conc	receptor	min	max	conc	receptor	conc	receptor	conc	receptor	conc	receptor	lower	upper	Screening Conc.	Source	Justification	Comments
	Benzene	71-43-2	ug/L	130	aquatic life	-	-	114	-	46	-	53	-	5300	-	-	-	114	3	REG-V	
	Benzenesulfonamide, 2-methyl	88-19-7	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Benzo(a)anthracene	56-55-3	ug/L	0.027	aquatic life	-	-	0.839	-	-	-	-	-	-	-	-	-	0.839	3	REG-V	receptor: mink, Fish & Wild. rat LOEL
	Benzo(a)pyrene	50-32-8	ug/L	0.014	aquatic life	-	-	0.014	-	0.014	-	-	-	-	-	-	-	0.014	3	REG-V	Great Lakes W.Q. mink 1.5 ug/L
	Benzo(b)fluoranthene	205-99-2	ug/L	-	-	-	-	9.07	-	-	-	-	-	-	-	-	-	9.07	3	REG-V	
	Benzo(g,h,i)perylene	191-24-2	ug/L	-	-	-	-	7.64	-	-	-	-	-	-	-	-	-	7.64	3	REG-V	
	Benzo(k)fluoranthene	207-08-9	ug/L	-	-	-	-	0.006	-	-	-	-	-	-	-	-	-	0.006	3	REG-V	
	Benzoic acid	65-85-0	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Bis(2-chloroethyl)ether	111-44-4	ug/L	-	-	-	-	1140	-	-	-	2360	-	-	-	-	-	1140	3	REG-V	
	Bis(2-ethylhexyl)phthalate	117-81-7	ug/L	0.12	-	-	-	2.1	-	32	-	0.3	-	-	-	-	-	2.1	3	REG-V	MN criteria; GLWQ 32 ug/L
	Bromodichloromethane	75-27-4	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Butyl benzyl phthalate	85-68-7	ug/L	19	aquatic life	-	-	49	-	19	-	22	-	-	-	-	-	49	3	REG-V	
	Cadmium	7440-43-9	ug/L	1.1	aquatic life	-	-	0.66	-	1	-	0.66	-	1.1	-	-	-	0.66	3	REG-V	
	Carbazole	86-74-8	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Carbon disulfide	75-15-0	ug/L	0.92	aquatic life	-	-	84.1	-	-	-	-	-	-	-	-	-	84.1	3	REG-V	
	Chlorodibromomethane	124-48-1	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Chloroform	67-66-3	ug/L	28	aquatic life	-	-	79	-	-	-	289	-	-	-	-	-	79	3	REG-V	
	Chromium	7440-47-3	ug/L	11	aquatic life	-	-	42	-	10	-	11	-	11	-	-	-	42	3	REG-V	
	Chrysene	218-01-9	ug/L	-	-	-	-	0.033	-	-	-	-	-	-	-	-	-	0.033	3	REG-V	receptor: mink, Fish & Wild. rat LOEL
	Copper	7440-50-8	ug/L	12	aquatic life	-	-	6	-	11	-	6.54	-	12	-	-	-	6	3	REG-V	MI criteria
	Cyanide	57-12-5	ug/L	5.2	aquatic life	-	-	5.2	-	5.2	-	5.2	-	5.2	-	-	-	5.2	3	REG-V	
	Cyclohexane, methyl-	108-87-2	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Dibenz(a,h)anthracene	53-70-3	ug/L	-	-	-	-	0.002	-	-	-	-	-	-	-	-	-	0.002	3	REG-V	
	Dibenzofuran	132-64-9	ug/L	3.7	aquatic life	-	-	20	-	20	-	-	-	-	-	-	-	20	3	REG-V	
	Dibenzofuran, 4-methyl-	7320-53-8	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Dibenzothiophene	132-65-0	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Dibromochloromethane	132-65-0	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Diethyl ether	60-29-7	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Diethyl phthalate	84-66-2	ug/L	210	aquatic life	-	-	3	-	220	-	521	-	-	-	-	-	3	3	REG-V	
	Diisobutyl phthalate	84-69-5	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Di-n-butyl phthalate	84-74-2	ug/L	1	piscivores	-	-	3	-	33	-	9.4	-	-	-	-	-	3	3	REG-V	
	Diphenylamine	122-39-4	ug/L	-	-	-	-	412.5	-	-	-	-	-	-	-	-	-	412.5	3	REG-V	
	Dodecanamide, N,N-bis(2-hydroxyeth	120-40-1	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Ethylbenzene	100-41-4	ug/L	7.3	aquatic life	-	-	17.2	-	290	-	453	-	32000	-	-	-	17.2	3	REG-V	
	Fluoranthene	206-44-0	ug/L	6.2	aquatic life	-	-	8.1	-	8.1	-	39.8	-	3980	-	-	-	8.1	3	REG-V	
	Fluorene	86-73-7	ug/L	3.9	aquatic life	-	-	3.9	-	3.9	-	-	-	-	-	-	-	3.9	3	REG-V	
	Furan, 2-methoxy-	25414-22-6	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Hexanoic acid	142-62-1	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	HMX	2691-41-0	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Hydrazine, 1,1-diphenyl-	530-50-7	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Indeno(1,2,3-cd)pyrene	193-39-5	ug/L	-	-	-	-	4.3	-	-	-	-	-	-	-	-	-	4.3	3	REG-V	
	Lead	7439-92-1	ug/L	3.2	aquatic life	-	-	1.3	-	2.5	-	1.32	-	3.2	-	-	-	1.3	3	REG-V	Fed. Ambient W. Q. criteria
	Mercury	7439-97-6	ug/L	1.3	aquatic life	-	-	0.0013	-	1.3	-	0.012	-	0.012	-	-	-	0.0013	3	REG-V	
	Methylene chloride	75-09-2	ug/L	2200	aquatic life	-	-	430	-	-	-	5500	-	-	-	-	-	430	3	REG-V	
	Naphthalene	91-20-3	ug/L	12	aquatic life	-	-	44	-	24	-	62	-	620	-	-	-	44	3	REG-V	
	n-Decane	124-18-5	ug/L	49	aquatic life	-	-	-	-	-	-	-	-	-	-	-	-	49	1	ORNL	
	Nickel	7440-02-0	ug/L	160	aquatic life	-	-	29	-	160	-	87.71	-	160	-	-	-	29	3	REG-V	
	Nitrocellulose	#N/A	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Nitrogen, Total Kjeldahl	10-07-1	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Nitroglycerin	55-63-0	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	N-Nitrosodiphenylamine	86-30-6	ug/L	-	-	-	-	13	-	-	-	58.5	-	-	-	-	-	13	3	REG-V	
	o,p'-DDT	789-02-6	ug/L	0.000041	piscivores	-	-	0.001	-	0.013	-	0.001	-	0.001	-	-	-	0.001	3	REG-V	
	Pentanal, 5-hydroxy-, (2,4-d...	3638-33-3	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

Appendix A - Summary of Ecological Screening Levels (ESLs)

	PARAMETER			ORNL PRGEE[1]		Region V - Pre 5/98[2]		Region V - Current[3]		USEPA OSWER ET[4]		Region IV ESV[5]		USEPA OST WQCSC[6]		Background Data[7]		Recommended ESLs			
MEDIA	PARAMETER	CAS No.	Units	conc	receptor	min	max	conc	receptor	conc	receptor	conc	receptor	conc	receptor	lower	upper	Screening Conc.	Source	Justification	Comments
	Phenanthrene	85-01-8	ug/L	6.3	aquatic life	-	-	2.1	-	-	-	-	-	6.3	-	-	-	2.1	3	REG-V	
	Phenol	108-95-2	ug/L	110	aquatic life	-	-	100	-	-	-	256	-	2560	-	-	-	100	3	REG-V	
	Phenylacetic acid	103-82-2	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Phenol, 4,4-butylidenebis[2...	85-60-9	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Prometon	1610-18-0	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	p-Toluenesulfonamide	70-55-3	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Pyrene	129-00-0	ug/L	-	-	-	-	0.3	-	-	-	-	-	-	-	-	-	0.3	3	REG-V	
	Quinoline, 2-methyl-	91-63-4	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	RDX	121-82-4	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Selenium	7782-49-2	ug/L	0.39	piscivores	-	-	5	-	5	-	5	-	5	-	-	-	5	3	REG-V	
	Silver	7440-22-4	ug/L	0.36	aquatic life	-	-	1	-	-	-	0.012	-	0.12	-	-	-	1	3	REG-V	
	Solids, Total (TS) SOLID MATRIX	10-31-1	%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Toluene	108-88-3	ug/L	9.8	aquatic life	-	-	253	-	130	-	175	-	17500	-	-	-	253	3	REG-V	
	Trichloroethene	79-01-6	ug/L	470	aquatic life	-	-	75	-	350	-	-	-	-	-	-	-	75	3	REG-V	
	Trichlorofluoromethane	75-69-4	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Vinyl chloride	75-01-4	ug/L	782	piscivores	-	-	9.2	-	-	-	-	-	-	-	-	-	9.2	3	REG-V	
	Xylenes	1330-20-7	ug/L	13	aquatic life	-	-	117	-	1.8	-	-	-	-	-	-	-	117	3	REG-V	
	Zinc	7440-66-6	ug/L	110	aquatic life	-	-	58.9	-	100	-	58.91	-	110	-	-	-	58.9	3	REG-V	Fed. Ambient W. Q. criteria

NOTES:

1 Oak Ridge National Laboratory, Preliminary Remediation Goals for Ecological Enpoints ES/ER/TM-162/R2, issued August 1997, verified March 1998.
2 USEPA Region V Ecological Data Quality Levels, August 1996, verified March 1998.
3 USEPA Region V Ecological Data Quality Levels May 1998, verified May 1998.
4 USEPA Office of Solid Waste Ecotoc Thresholds, January 1996.
5 USEPA Region IV Ecological Screening Values, October 1996, verified March 1998.
6 USEPA Office of Science and Technology, Water Quality Criteria Summary Concentrations, 1997
7 Background Concentrations: RCRA Phase I RFI, Olin Corporation (Table 9A-1 - US Geological survey. 1984. Element concentrations in soils and Other surficial Materials of the Conterminous United States. USGS Prof. Paper 1270. Hasford T. Shacklette and Jos
8 Human Health Screening Levels: RCRA Phase I RFI, Olin Corporation (Table 9A-2)
9 Soil Quality Screening Levels (Protective of Ground-Water Quality): RCRA Phase I RFI, Olin Corporation (Table 9A-3)

\- No innformation available
OAV Only available value
ORNL Oak Ridge National Laboratory Screening Level
MAV Mean of available values (Mean calculation includes values from Region V EDQLs[2] not presented in this table - only the minimum and maximum EDQLs are presented)
REG-V Region V value available

APPENDIX B

HABITAT TYPES AND POTENTIAL ECOLOGICAL RECEPTORS

Table B-1: Amphibians and Reptiles Observed on the Olin Main Plant Facility - May 1-5, 1995

SPECIES	Wildlife Habitat Types[a]						
	OF	SH	DF	OW	WM	AG	IN
Salamanders							
Mole salamander *Ambystoma sp.*		X	X	X			
Toads and Frogs							
Dwarf American toad *Bufo americanus charlesmithi*			X	X			
Blanchard's cricket frog *Acris crepitans blanchardi*			X	X			
Western chorus frog Pseudacris triseriata			X	X	X		
Wood Frog *Rana sylvatica*			X	X			
Turtles							
Eastern box turtle *Terrapene c. carolina*			X			X	
Midland painted turtle *Chrysemys picta marginata*			X	X			
Snakes							
Blue racer *Coluber constrictor foxii*			X				

[a] Wildlife Habitat Types:
- OF - Open Field
- SH - Shrub
- DF - Deciduous Forest
- OW - Open Water
- WM - Wet Meadow/Emergent Wetland
- AG - Agriculture
- IN - Industrial

Source: Phase I RFI - Table 10-3.

Table B-2: Birds Observed on the Olin Main Plant Facility - May 1-5, 1996

SPECIES	Wildlife Habitat Types[a]							Status[b]
	OF	SH	DF	OW	WM	AG	IN	
Great blue beron *Ardea herodias*				X				M
Canada goose *Branta canadensis*			FO[c]					M
Wood duck *Aix sponsa*			X	X				PB
Mallard *Anas platyrhynchos*			X	X	X			PB
Turkey vulture *Cathartes aura*			FO[c]					M
Red-tailed hawk Buteo jamaicensis	X							PB
American kestrel *Falco sparverius*	X					X	X	PB
Wild turkey *Meleagris gallopavo*	X							PB
Northern bobwhite *Colinus virginianus*			X					PB
Killdeer *Charadrius vociferus*	X				X	X	X	PB
Common snipe *Gallinago gallinago*					X			M
Rock dove (pigeon) *Columba livia*							X	PB
Mourning dove *Zenaida macroura*		X	X				X	PB

a. Vegetative Cover Types
- OF - Open Field
- SH - Shrub
- DF - Deciduous Forest
- OW - Open Water
- WM - Wet Meadow/Emergent Wetland
- AG - Agriculture
- IN - Industrial

b. PB = Probable Breeding species based on known breeding in vicinity (Breeding Bird Surveys), and suitable habitat on the site.
M = Migrant, that is, species not recorded as breeder in nearby Breeding Bird Surveys, or habitat on the site not suitable.

c. FO = Flyover

Source: Phase I RFI - Table 10-4.

Table B-2: Birds Observed on the Olin Main Plant Facility - May 1-5, 1996

SPECIES	Wildlife Habitat Types[a]							Status[b]
	OF	SH	DF	OW	WM	AG	IN	
Yellow-billed cuckoo *Coccyzus americanus*			X					PB
Barred owl *Stryx varia*			X					PB
Chimney swift *Chaetura pelagica*	X	X	X				X	PB
Belted kingfisher *Ceryle alcyon*				X				PB
Red-headed woodpecker *Melanerpes*			X					PB
Red-bellied woodpecker *Melanerpes carolinus*			X					PB
Downy woodpecker *Picoides pubescens*	X	X	X					PB
Hairy woodpecker *Picoides villosus*	X		X					PB
Northern flicker *Colaptes auratus*			X				X	PB
Pileated woodpecker *Dryocopus pileatus*			X					PB
Least flycatcher *Empidonax minimus*		X	X					M
Eastern phoebe *Sayornis phoebe*	X		X				X	PB
Great crested flycatcher *Myiarchus crinitus*			X					PB
Eastern kingbird *Tyrannus tyrannus*	X		X				X	PB
Purple martin *Progne subis*			X					M
Tree swallow *Tachycineta bicolor*	X				X			PB
Northern rough-winged swallow *Stelgidopteryx serripennis*	X	X			X			PB
Barn swallow *Hirundo rustica*	X	X	X		X	X		PB
Blue jay *Cyanocitta cristata*	X	X	X					PB
American crow *Corvus brachyrhynchos*	X		X			X		PB
Black-capped chickadee *Parus atricapillus*			X					PB
Carolina chickadee *Parus carolinensis*			X					PB

Table B-2: Birds Observed on the Olin Main Plant Facility - May 1-5, 1996

SPECIES	Wildlife Habitat Types[a]							Status[b]
	OF	SH	DF	OW	WM	AG	IN	
Tufted titmouse *Parus bicolor*		X	X					PB
White-breasted nuthatch *Sitta carolinensis*			X					PB
Carolina wren *Thryothorus ludovicianus*		X	X					PB
House wren *Troglodytes aedon*			X					PB
Blue-gray gnatcatcher *Polioptila caerulea*		X	X					PB
Eastern bluebird *Sialia sialis*			X				X	PB
Veery *Catharus fuscescens*			X					M
Swainson's thrush *Catharus ustulatus*			X					M
American robin *Turdus migratorius*	X	X	X			X	X	PB
Gray catbird *Dumetella carolinensis*		X						PB
Northern mockingbird *Mimus polyglottos*	X	X					X	PB
Brown thrasher *Toxostoma rufum*			X					PB
Cedar waxwing *Bombycilla cedrorum*			X					PB
European starling *Sturnus vulgaris*	X	X	X			X	X	PB
White-eyed vireo *Vireo griseus*		X	X					PB
Red-eyed vireo *Vireo olivaceus*			X					PB
Blue-winged warbler *Vermivora pinus*		X	X					PB
Tennessee warbler *Vermivora peregrina*			X					M
Northern parula *Parula americana*		X	X					PB
Yellow warbler *Dendroica petechia*		X	X					PB
Yellow-rumped warbler *Dendroica coronata*	X	X	X					M
Black-throated green warbler *Dendroica virens*		X	X					M

Table B-2: Birds Observed on the Olin Main Plant Facility - May 1-5, 1996

SPECIES	Wildlife Habitat Types[a]							Status[b]
	OF	SH	DF	OW	WM	AG	IN	
Palm warbler *Dendroica palmarum*	X	X	X					M
Bay-breasted warbler *Dendroica castanea*			X					M
Black-and-white warbler *Mniotilta varia*		X	X					M
Cerulean warbler *Dendroica cerulea*			X					PB
Prothonotary warbler *Protonotaria citrea*			X	X				PB
Louisiana waterthrush *Seiurus motacilla*			X					M
Mourning warbler *Oporornis philadelphia*		X	X					M
Common yellowthroat *Geothlypis trichas*			X					PB
Yellow-breasted chat *Icteria virens*		X						PB
Summer tanager *Piranga rubra*			X					PB
Northern cardinal *Cardinalis cardinalis*	X	X	X					PB
Rose-breasted grosbeak *Pheucticus ludovicianus*			X					PB
Indigo bunting *Passerina cyanea*			X					PB
Rufous-sided towhee *Pipilo eryhrophthalmus*		X	X					PB
Chipping sparrow *Spizella passerina*	X	X						PB
Song sparrow *Melospiza melodia*	X		X					PB
White-throated sparrow *Zonotrichia albicollis*			X					M
Red-winged blackbird *Agelaius phoeniceus*	X	X	X		X	X	X	PB
Eastern meadowlark *Sturnella magna*	X					X	X	PB
Western meadowlark *A159*	X							M
Common grackle *Quiscalus quiscula*	X	X	X	X		X	X	PB
Brown-headed cowbird *Molothrus ater*	X		X					PB

Table B-2: Birds Observed on the Olin Main Plant Facility - May 1-5, 1996

SPECIES	Wildlife Habitat Types[a]							Status[b]
	OF	SH	DF	OW	WM	AG	IN	
Northern oriole *Icterus galbula*	X		X					PB
American goldfinch *Carduelis tristis*	X	X	X	X				PB
House finch *Carpodacus mexicanus*	X		X				X	PB
House sparrow *Passer domesticus*	X						X	PB

Table B-3: Winter Birds in the Vicinity[a] of the Olin Main Plant Facility

SPECIES	ABUND.[b]	OCCUR.[c]
Pied-billed grebe *Podilymbus podiceps*	U	L/I
Double-crested cormorant *Phalacrocoras auritus*	U	L/I
Great blue heron *Ardea herodias*	U	L/I
Tundra swan *Cygnus colombianus*	U	L/I
Mute swan *Cygnus olor*	U	L/I
Greater white-fronted goose *Anser albirfions*	U	L/I
Snow goose *Chen caerulescens*	A	L/R
Ross goose *Chen rossii+A34*	U	L/I
Wood duck *Aix sponsa*	U	L/I
Green-winged teal *Anas crecca*	U	L/I
Canada goose *Branta canadensis*	A	W/R
American black duck *Anas rubripes*	U	L/R
Mallard *Anas platyrhynchos*	A	W/R
Northern pintail *Anas acuta*	C	L/R
Northern shoveler *Anal clypeata*	U	W/R
Greater scaup *Aythya marila*	U	L/I
Bufflehead *Bucephala albeola*	U	W/R
Gadwall *Anas strepera*	U	W/R
American wigeon *Anas americana*	U	W/R
Canvasback *Aythya valisineria*	A	W/R
Ring-necked duck *Aythya collaris*	C	W/R
Lesser scaup *Aythya affinis*	U	W/I
Common goldeneye *Bucephala clangula*	A	W/R
Common merganser *Mergus merganser*	C	W/R

[a] Table compiled from Christmas Bird Counts from Collinsville, IL, Elsah, IL, and Pere Marquette Park, IL, from 1990, 1991, and 1992.

[b] Using averge number of birds seen in the above counts, the following abundance designations were assigned:

U = Uncommon (1 - 10 individuals per count)

C = Common (11 - 100 individuals per count)

A = Abundant (>100 individuals per count)

[c] Occurrence designations as follows:

L = Local - only occurrred at one location

W = Widespread - occurs in 2 or 3 locations

R = Regular - occurs each year

I = Irregular - occurs in only 1 or 2 years

Source: Phase I RFI - Table 10-5.

Table B-3: Winter Birds in the Vicinity[a] of the Olin Main Plant Facility

SPECIES	ABUND.[b]	OCCUR.[c]
Ruddy duck *Oxyura jamaicensis*	C	W/I
Hooded merganser *Lophdytes cucullatus*	U	W/I
Turkey vulture *Cathartes aura*	U	L/I
Bald eagle *Haliaeetus leucocephalus*	C	W/R
Northern harrier *Circus cyaneus*	U	W/R
Sharp-shinned hawk *Accipiter striatus*	U	W/R
Cooper's hawk *Accipiter cooperii*	U	W/R
Northern goshawk *Accipiter gentilis*	U	L/I
Red-shouldered hawk *Buteo lineatus*	U	W/I
Red-tailed hawk *Buteo jamaicensis*	C	W/R
Rough-legged hawk *Buteo lagopus*	U	W/R
Golden eagle *Aquila chrysaetos*	U	L/I
American kestrel *Falco sparverius*	C	W/R
Ring-necked pheasant *Phasianus colchicus*	U	L/I
Wild turkey *Meleagris gallopavo*	C	W/R
Northern bobwhite *Colinus virginianus*	C	W/R
American coot *Fulica americana*	C	L/I
Killdeer *Charadrius vociferus*	U	W/R
Common snipe *Gallinago gallinago*	U	L/I
Bonaprte's gull *Larus philadelphia*	U	L/I

SPECIES	ABUND.[b]	OCCUR.[c]
Ring-billed gull *Larus delawarensis*	A	W/R
Herring gull *Larus argentatus*	U	W/R
Rock dove (pigeon)	A	W/R
Mourning dove *Zenaida macroura*	A	W/R
Eastern screech-owl Otus asio	U	W/I
Great horned owl *Bubo virginianus*	U	W/R
Barred owl *Stryx varia*	U	W/R
Belted kingfisher *Ceryle alcyon*	U	W/R
Red-headed woodpecker *Melanerpes erythrocephalu*	C	W/R
Red-bellied sapsucker *Melanerpes carolinus*	C	W/R
Yellow-bellied sapsucker *Sphyrapicus varius*	U	W/I
Downy woodpecker *Picoides pubescens*	C	W/R
Harry woodpecker *Picoides villosus*	U	W/R
Northern flicker *Colaptes auratus*	C	W/R
Pileated woodpecker *Dryocopus pileatus*	U	W/R
Horned lark *Eremophila alpestris*	C	W/R
Blue jay *Cyanocitta cristata*	A	W/R
American crow *Crovus brachyrhynchos*	A	W/R
Black-capped chickadee *Parus atricapillus*	C	W/R
Carolina chickadee *Parus carolinensis*	U	L/R

Table B-3: Winter Birds in the Vicinity[a] of the Olin Main Plant Facility

SPECIES	ABUND.[b]	OCCUR.[c]
Tufted titmouse *Parus bicolor*	C	W/R
Red-breasted nuthatch *Sitta canadensis*	U	L/I
White-breasted nuthatch *Sitta carolinensis*	C	W/R
Brown creeper *Certhia americana*	U	W/R
Carolina wren *Thryothorus ludovicianus*	C	W/R
House wren *Troglodytes aedon*	U	L/I
Winter wren *Troglodytes troglodytes*	U	L/I
Marsh wren *Cistothorus palustris*	U	L/I
Golden-crowned kinglet *Regulus satrapa*	U	W/R
Ruby-crowned kinglet *Regulus satrapa*	U	L/I
Eastern bluebird *Sialia sialis*	U	W/R
Hermit thrush *Catharus guttatus*	U	L/I
American robin *Turdus migratorius*	C	W/R
Northern mockingbird *Mimus polyglottos*	C	W/R
Brown trasher *Toxostoma rufum*	U	W/I
Cedar waxwing *Bombycilla cedrorum*	C	W/R
Loggerhead shrike *Lanius ludovicianus*	U	W/I
European starling *Sturnus vulgaris*	A	W/R
Yellow-rumped warbler *Dendrocia coronata*	U	W/I
Northern cardinal *Cardinalis cardinalis*	A	W/R

SPECIES	ABUND.[b]	OCCUR.[c]
Rufous-sided towhee *Pipilo eryhrophthalmus*	U	W/R
Chipping sparrow *Spizella passerina*	U	L/I
American tree sparrow *Spizella arborea*	C	W/R
Field sparrow *Spizella pusilla*	U	W/R
Savannah sparrow *Passerculus sandwichensis*	U	L/I
Vesper sparrow *Pooecetes gramineus*	U	L/I
Fox sparrow *Passerella iliaca*	U	L/R
Song sparrow *Melospiza melodia*	C	W/R
Lincoln's sparrow *Melospiza lincolnii*	U	L/I
Swamp sparrow *Melospiza georgiana*	U	W/R
White-throated sparrow *Zonotrichia albicollis*	C	W/R
White-crowned sparrow *Zonotrichia leucophrys*	U	W/R
Dark-eyed junco *Junco hyemalis*	A	W/R
Lapland longspur Calcarius lapponicus	C	W/I
Red-winged blackbird *Agelaius phoeniceus*	A	W/R
Eastern meadowlark *Sturnella magna*	U	W/R
Rusty blackbird *Euphagus carolinus*	C	W/R
Common grackle *Quiscalus quiscula*	A	W/R
Brown-headed cowbird *Molothrus ater*	C	W/R
Purple finch *Carpodacus purpureus*	U	W/R

Table B-3: Winter Birds in the Vicinity[a] of the Olin Main Plant Facility

SPECIES	ABUND.[b]	OCCUR.[c]
House finch *Carpodacus mexicanus*	C	W/R
Common redpoll *Carduelis flammea*	U	L/I
Pine siskin *Carduelis pinus*	U	L/I
American goldfinch *Carduelis tristis*	C	W/R
House sparrow *Passer domesticus*	A	W/R
Eurasian tree sparrow *Passer montanus*	C	W/R

Table B-4: Mammals Observed on the Olin Main Plant Facility - May 1-5, 1995

SPECIES	Wildlife Habitat Types[a]						
	OF	SH	DF	OW	WM	AG	IN
Eastern cottontail *Sylvilagus floridanus*		X	X				
Eastern chipmunk *Tamias striatus*			X				
Woodchuck *Marmota monax*	X		X				
Fox squirrel *Sciurus niger*	X	X	X				
Beaver *Castor canadensis*				X			
Vole sp. Microtus sp.					X		
Coyote *Canis latrans*		X	X				
Gray fox *Urocyon cinereoargenteus*		X					
Raccoon *Procyon lotor*	X		X				
White-tailed deer *Odocoileus virginianus*	X	X	X			X	X

[a] Wildlife Habitat Types:
OF - Open Field
SH - Shrub
DF - Deciduous Forest
OW - Open Water
WM - Wet Meadow/Emergent Wetland
AG - Agriculture
IN - Industrial

Source: Phase I RFI - Table 10-6.

Copy 1 RFI Material

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Screening Ecological Risk Assessment Work Plan

Prepared for:

Olin

Olin Corporation - East Alton, Illinois

Prepared by:

ADVENT

September 1997

Environmental Consulting and Design

SCREENING ECOLOGICAL RISK ASSESSMENT WORK PLAN

Prepared for:

OLIN CORPORATION

East Alton, Illinois

Prepared by:

ADVENT ENVIRONMENTAL, INC.

Louisville, Kentucky

September 1997

ADVENT Project 47555

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1.0 INTRODUCTION

On June 6, 1997, Olin Corporation (Olin) submitted to USEPA, Region V, a Conceptual Approach to Performing an Ecological Risk Assessment (Conceptual Approach) for its Main Plant Facility (MPF) located in East Alton, Illinois. This submittal described several facets of the Ecological Risk Assessment (ERA) process including performance of a Screening Ecological Risk Assessment (SERA). Olin agreed to prepare a SERA Work Plan and proposed a schedule for its submittal.

On July 24, 1997, Olin received notice from USEPA that the proposed Conceptual Approach and schedules for submittal of the SERA Work Plan (Work Plan) and Draft Phase II RFI Work Plan were acceptable.

The following Work Plan has been prepared based on the USEPA-approved Conceptual Approach. Figure 1 of the Work Plan identifies the site location of the MPF while Figure 2 identifies the location of the solid waste management units (SWMUs) which are subject to the SERA.

1.1 Statement of Purpose

This Work Plan presents the methodology to be used to perform the SERA for the MPF. The Work Plan discusses the elements of the ERA process and describes the data and information developed during the Phase I RFI site characterization activities which will be used to perform the SERA.

1.2 Guidance

The methodology and scope presented in this Work Plan was developed from, and is consistent with, USEPA guidance documents. The primary guidance utilized to prepare this Work Plan was the *Proposed Guidelines for Ecological Risk Assessment* (Risk

Assessment Forum, USEPA, Washington, D.C. August, 1996, EPA/630/R-95/002B). Additional guidance included: *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments, Internal Review Draft* (Environmental Response Team, USEPA, Edison, NJ. June, 1996); and *Ecological Risk Assessment Guidance for RCRA Corrective Action Region V, Interim Draft* (USEPA Region V Waste Management Division, Chicago, IL 1994). In addition to the aforementioned documents, additional guidance was obtained through conversations with Dan Mazur and William Enriquez of Region V on August 19, 1997.

1.3 Discussion of Scope of Work for the SERA

It is recognized throughout the guidance used to prepare this Work Plan that ecological risk assessments usually follow a tiered or phased approach and vary in complexity from simple screening evaluations to detailed quantitative ecological risk assessments and studies. As stated in the USEPA-approved Conceptual Approach, only those constituents at each SWMU which were identified in the Phase I RFI Report at concentrations equal to or greater than their corresponding practical quantitation limit (PQL), and for which published ecological screening levels (ESLs) exist, will be considered and carried through the SERA. All data and scenarios will be evaluated utilizing an industry specific approach.

Site characterization information (i.e., constituents above PQLs) gathered during the Phase I RFI will be used in an initial screening. Risk-based screening levels will be obtained from USEPA-recommended sources such as *Preliminary Remediation Goals for Ecological Endpoints,* July, 1996, *Ecological Data Quality Levels,* August, 1996, *Ecotox Thresholds* January, 1996, *Water Quality Criteria Summary Concentrations,* August, 1997, and *Supplemental Guidance to RAGS: Region 4 Bulletins Ecological Screening Values,* January, 1997. The risk-based screening levels will serve as the only ecological screening levels (ESLs) to be used in the SERA. Should the USEPA-recommended sources not list an ESL for a given constituent, then no value will be created and that constituent will be removed from further consideration. Figures 3 and 4 depict the

planned SERA process. Table 1 presents the SWMUs considered for evaluation in the SERA.

A report describing the SERA will be prepared and submitted to USEPA for its approval. The report will discuss the elements of the ERA process: 1) Problem Formulation; 2) Analysis; and 3) Risk Characterization. Conclusions and recommendations concerning the need for additional ecological risk assessment will be presented.

The goal of the SERA is to evaluate ecological risks associated with the site. If the evaluation demonstrates that no ecological risk is present, further assessment of ecological risk would not be necessary and the ecological risk assessment process would be complete. If potential ecological risks are identified, then further evaluation or risk management decisions may be appropriate.

2.0 SITE CHARACTERIZATION

2.1 Site Background

Manufacturing operations have been conducted at the MPF by Olin (and its predecessor companies) since 1892. Two manufacturing divisions of Olin (the Brass Division and the Winchester Division) currently operate at the MPF. The Brass Division manufactures copper-based alloy strip and fabricated products. The Winchester Division manufactures small arms ammunition, ammunition components, and explosives. Environmental affairs for both divisions are coordinated by the Environmental Services Department.

The MPF is located in the Village of East Alton, Illinois, which is in the west-central part of the state. The MPF is approximately 17 miles northeast of St. Louis, Missouri, and 2 miles east of the Mississippi River. The East Fork of the Wood River runs through the MPF.

As stated above, industrial activities have been in operation since 1892. Facility designated Zones 1 through 7 are used for industrial purposes. Major manufacturing activities at the MPF are conducted in Zones 1, 2, and 4. Zone 1 has been the site of ammunition manufacturing and ballistics testing for more than 70 years. The Zone 2 area was used for the manufacturing of explosives beginning in 1892 and ending in approximately 1970. The fiber (cellulose) wad manufacturing process is still in operation in Zone 2. Zone 4 has been a manufacturing area for more than 45 years. Zones 3, 5, 6, and 7 are used for support operations in the form of incineration and steam production facilities, magazine storage for explosives, wastewater treatment facilities, and water filtration facilities, respectively. Zones 14 and 15 are recreational facilities for Olin employees. Historically, up to 74% of the facility has been used for industrial activities.

2.2 Phase I RCRA Facility Investigation

The MPF is subject to a two-phased RFI as described in Olin's RCRA permit. Phase I of the RFI was implemented in October 1994 by Philip Environmental (formerly Burlington Environmental) in accordance with the USEPA-approved Phase I RFI Work Plan. During the Phase I activities, the geology and hydrogeology of the MPF and SWMU boundaries were defined. Samples of soil, sediment, surface water, and ground water were collected and analyzed. Chemicals of potential concern (COPCs) were identified at each SWMU based on a human health risk evaluation.

Although not required by the USEPA-approved Phase I RFI Work Plan, Olin performed a baseline terrestrial ecology assessment during Phase I. This assessment observed and documented the flora and fauna at the MPF. No obvious disparities in species richness, abundance, or indications of contaminant impact (such as stressed vegetation or dead animals) were observed. No on-site documentation revealed the presence of any U.S. Fish & Wildlife Service or Illinois Department of Conservation listed endangered or threatened species.

A Draft Phase I RFI Report (Draft Report) describing the Phase I activities was prepared and submitted to USEPA on September 29, 1995. The Draft Report includes analytical results of samples collected, conclusions, and recommendations for Phase II activities. Section 10 of the Draft Report discusses the terrestrial ecology assessment. USEPA approval of the Draft Report is pending implementation of the SERA and Agency approval of the SERA Report.

2.3 Ecological Assessment

A site reconnaissance of the MPF was conducted on August 7, 1997, in order to update and validate SWMU specific vegetative cover/land use conclusions presented in Chapter 10, Ecological Assessment, of the Draft Report. The Ecological Assessment described the MPF by zones. The SERA will build upon the information presented in the

Ecological Assessment with a SWMU-specific emphasis. During the site reconnaissance, several types of vegetative cover/land use was observed, and those directly associated with the SWMUs include: open water areas, seasonal water areas, deciduous forests, open fields, industrial areas (including parking areas), and agricultural fields. The ecological assessment, vegetative cover/land use types and RFI data will be utilized to determine potential endpoint/receptors for each SWMU. Endpoints/receptors, if any, will be compared with those endpoints utilized to determine the appropriate ESLs.

3.0 ECOLOGICAL RISK ASSESSMENT

Ecological risk assessment is a process to estimate risk or the probability of adverse effects to ecological receptors. The ERA conducted as part of the SERA will evaluate the likelihood that adverse ecological effects (risk) may or may not occur as a result of SWMU-specific conditions. In order for risk to be present, an ecological receptor must be exposed (or have the potential for exposure) to a stressor. The SERA will focus on stressors (constituents detected at concentrations equal to or greater than their corresponding practical quantitation limit) identified at each SWMU during Phase I of the RFI.

The following describes the three phases of the ERA process to be used in performing the SERA. These phases are also depicted in Figures 3 and 4.

3.1 Problem Formulation

The problem formulation phase of the SERA will identify SWMU-specific goals and assessment endpoints, prepare a conceptual model, and provide a framework for the subsequent analysis phase. Problem formulation will provide an overall concept of how ecological effects may or may not occur as a result of conditions at the individual SWMUs. Management goals for the SWMUs, site characterization data, and ecological receptor information will be used to develop assessment endpoints, a conceptual model, and an analysis plan for the SWMU.

In this phase, exposure and ecological effects, including stressor characteristics, the ecosystem potentially at risk, and the ecological effects expected or observed, will be identified. The terrestrial ecological assessment performed during Phase I of the RFI will be used to characterize important habitat and identify ecological receptors. Constituent data collected during the Phase I RFI will be reviewed to identify those constituents to be assessed during the SERA.

Upon completion of the above step, assessment endpoints will be identified. Assessment endpoints are defined as important ecological receptors. Their selection will be based on ecological relevance and susceptibility to stressors.

Information gathered during the characterization and assessment endpoint steps will form the basis of the conceptual model. The conceptual model will consist of potential sources of contamination, release mechanisms, exposure pathways, and receptors. The identification of assessment endpoints (receptors) will then be used to identify appropriate risk-based screening levels and the media of concern.

At the end of the problem formulation phase, data considered to be appropriate, based on Agency guidance, for use in the risk characterization of the SERA will be identified. These data will be used to determine potential exposures and exposure levels and then incorporated into the conceptual model for the SWMU during the analysis phase.

3.2 Analysis

In the analysis phase of the SERA, SWMU-specific exposures to the constituents identified in the problem formulation phase will be identified and the relationship between the level of exposure and adverse ecological effects evaluated. The analysis phase will have two major components: 1) characterization of exposure; and 2) characterization of ecological effects. The SWMU-specific data available will be further evaluated to describe the nature and extent of contamination in relationship to potential ecological exposures. The constituent-specific exposure levels will then be related to possible ecological effects. The potential of ecological effects is a function of the toxicity of the constituent and the susceptibility of the ecological receptor.

The level of exposure is a function of direct contact to the constituent or uptake through ingestion. The opportunity for direct contact or uptake will be qualitatively evaluated on a SWMU-specific basis in the SERA. Specific quantitative levels of exposure will not be

assessed as part of the SERA. General exposure assumptions and parameters utilized to develop the ESLs are considered appropriate for this SERA.

The analysis phase of the SERA will characterize exposures as to the source, receptor, pathway, and extent of exposure to provide an exposure profile. These will be qualitative evaluations in the SERA. The source of exposure will be identified based on findings of the site characterization. If constituents are not identified above PQLs, then no significant ecological source of a stressor will be identified and further evaluation in the SERA will not be conducted. Receptors which may experience exposures to constituents above screening levels in a given media will be identified on a SWMU-specific basis and termed constituents of ecological concern (COECs).

Pathways for exposure will also be evaluated using SWMU-specific characteristics presented in the Draft Report. If exposure pathways are not present, then ecological risks do not exist and further evaluation of the SWMU in the SERA will not be conducted.

If a pathway for exposure is identified, the extent of exposure will be qualitatively evaluated in the SERA to identify SWMUs which may be associated with minimal versus extensive exposures. The extent of exposure is a function of the temporal (frequency and duration) and spatial (extent) characterization of exposure.

The pathways and extent of exposure will then be summarized into a SWMU-specific exposure profile.

The second step of analysis is the characterization of ecological effects which is a function of the toxicity of individual COECs and the susceptibility of the receptor. COECs which are not considered toxic to the SWMU-specific receptors will not be evaluated further in that SWMU. COECs which are toxic and have ESLs appropriate for the SWMU-specific receptors will be evaluated. The toxicity of the COEC is incorporated into the ESLs to be used in the SERA. Specific, quantitative evaluation of the toxicity of COECs identified at the SWMU will not be conducted as part of the SERA.

3.3 Risk Characterization

Risk characterization is the last phase of the ecological risk assessment component of the SERA. In the risk characterization phase, the results of the problem formulation and the analysis phases will be integrated to provide an evaluation of potential ecological risk. Risk is a function of the toxicity of a constituent and the level of exposure. Risk characterization is the method for identifying the likelihood of adverse ecological effects.

The risk characterization phase will focus on the SWMU-specific data and receptors to provide a qualitative evaluation of potential risks. The risk characterization phase will use a focused, risk-screening evaluation rather than a full, quantitative assessment. Potential SWMU-specific risks will first be characterized by evaluating the presence or absence of toxic COECs. If toxic COECs are not detected at the SWMU, then no risk will be identified and no ecological risks characterized. Further evaluation of the SWMU will not be conducted. If toxic COECs are present, then the next step of the risk characterization will be to evaluate potential receptors and exposures. If receptors or exposure pathways are not present at the SWMU, then no risk will be identified, no risk characterized, and further evaluation not conducted. These two elements will provide additional management decision points for the SERA.

If toxic COECs, receptors, and exposure mechanisms have been identified at the SWMU, then further characterization of potential risks will be conducted. Potential ecological risks will be characterized qualitatively by comparison of SWMU-specific COEC concentrations to ESLs. Screening levels will be obtained from USEPA-recommended sources which will include:

Preliminary Remediation Goals for Ecological Endpoints
Environmental Restoration Risk Assessment Program
Oak Ridge National Laboratory
Oak Ridge, Tennessee, July, 1996

Ecological Data Quality Levels
USEPA Region V
Office of RCRA
Chicago, Illinois, August, 1996

Ecotox Thresholds
USEPA OSWER
EPA 540/F-95/038
January, 1996

Water Quality Criteria Summary Concentrations
USEPA OST Health and Ecological Criteria Division
1994, verified August, 1997

Supplemental Guidance to RAGS: Region 4 Bulletins
Ecological Screening Values
USEPA Region 4 Waste Management Division Office of Technical Services
January, 1997

Specific screening levels will not be developed as part of the SERA.

Risks will then be characterized by determining if SWMU-specific constituent concentrations exceed or are less than ESLs. If no constituents exceed risk-based criteria, then the associated risk level will be considered to be below the level of concern. It will then be concluded that no significant ecological risks are associated with the SWMU and further evaluation is not necessary. If exceedances (COECs) are identified, then potential ecological risks will be characterized as above the screening levels. Further evaluation of the specific COECs which exceed screening levels and receptors or exposure pathways present at the SWMU will be conducted during the Risk Management Evaluation phase of the SERA.

4.0 RISK MANAGEMENT EVALUATION

The results of the problem formulation, analysis, and risk characterization phases will be used to direct and support a risk management evaluation of the SWMUs. As discussed in the ecological risk assessment section, several opportunities for risk management decisions are present throughout the process. The risk management evaluation will discuss those risk management decisions made through the process of the risk assessment. Also presented will be additional risk management evaluations/decisions conducted at the end of the risk assessment. The results of the risk characterization will be the primary basis for additional risk management evaluations. If no risks are characterized as associated with conditions at the respective SWMUs, then additional evaluation will not be necessary and the SERA will be concluded for those SWMUs. If risks have been characterized as exceeding screening levels and exposure to a receptor is possible, then additional evaluation will be necessary. This may take the form of more detailed and specific assessment of SWMU conditions, COEC toxicity endpoints, receptor analysis, exposure assessment, and more detailed risk characterization. The extent of additional evaluations will, however, be limited in the SERA. Additionally, risk management decisions may be considered at this time which could change SWMU conditions, alter receptors, or affect exposure pathways.

5.0 REPORT PREPARATION

5.1 Summary and Conclusions

A summary of the elements of the site characterization used in the ecological risk assessment will be presented. The SERA Report will include:

- Results of the ecological risk assessment;
- Elements of the problem formulation and analysis phases;
- A summary of the risk characterization phase; and
- Development of SWMU-specific conclusions related to potential ecological risks associated with SWMU-specific conditions.

Examples of tables to be presented in the SERA report are included in Appendix A.

5.2 Recommendations

The SERA will be performed to provide a SWMU-specific evaluation of potential ecological risks. The results of the risk assessment and additional risk management evaluations will provide the basis for recommendations. These may include the recommendations that no further action be taken at a particular SWMU, that additional assessment be conducted to further characterize potential ecological risks, or that risk management actions be conducted in response to the characterization of potential ecological risks. The recommendations may also influence the RCRA Phase II Work Plan. The specific recommendations will be dependent on the results of the SERA and risk management decisions.

6.0 SCHEDULE

The SERA Report will be submitted to USEPA within 120 days from the receipt of Agency approval of this Work Plan.

TABLES

Table 1: SWMUs Located at the MPF

Zone	SWMU	Zone	SWMU
1	15a	4	1
	15b		2
			3/4
2	7a		16
	7b		18
	8		
	9a		
	9b	5	5
	9c		6
	9d		19
	10		
	11	6	20
	12		
	13	7	--
	14		
	17	14	16
	22		
	23	15	--
	24		
	25		
	26		
3	--		

Notes:

-- = No SWMUs present

SWMU = Solid Waste Management Unit

SWMUs 24 and 26 will be evaluated in Phase II of the RFI.

Prepared by:

Checked by:

FIGURES

SOURCE:
U.S. Geological Survey
Alton ILL.-MO. Quadrangle 1994, Bethalo, ILL. Quadrangle (1954) Revised 1993,
Columbia Bottom, MO.-ILL. Quadrangle 1994 & Wood River, ILL.-MO. Quadrangle 1994
7.5 Minute Series (Topographic)

QUADRANGLE LOCATION

0 0.5 1.0
APPROXIMATE SCALE IN MILES

0 1000 2000 3000 4000 5000
APPROXIMATE SCALE IN FEET

REVISION	DESCRIPTION	DATE	APPROVED	MADE

REVISIONS

	BY	DATE		BY	DATE
DESIGNED:			DRAWN:	U.S.G.S.	1993+1994
CHECKED:			CADD FILE:	47555-1	09/16/97
APPROVED:					

PREPARED BY: ADVENT

PREPARED FOR: OLIN CORPORATION
MAIN PLANT FACILITY
EAST ALTON, ILLINOIS

SITE LOCATION MAP

SCALE	PROJECT NUMBER	FIGURE NUMBER	REVISION
AS SHOWN	47555	1	-

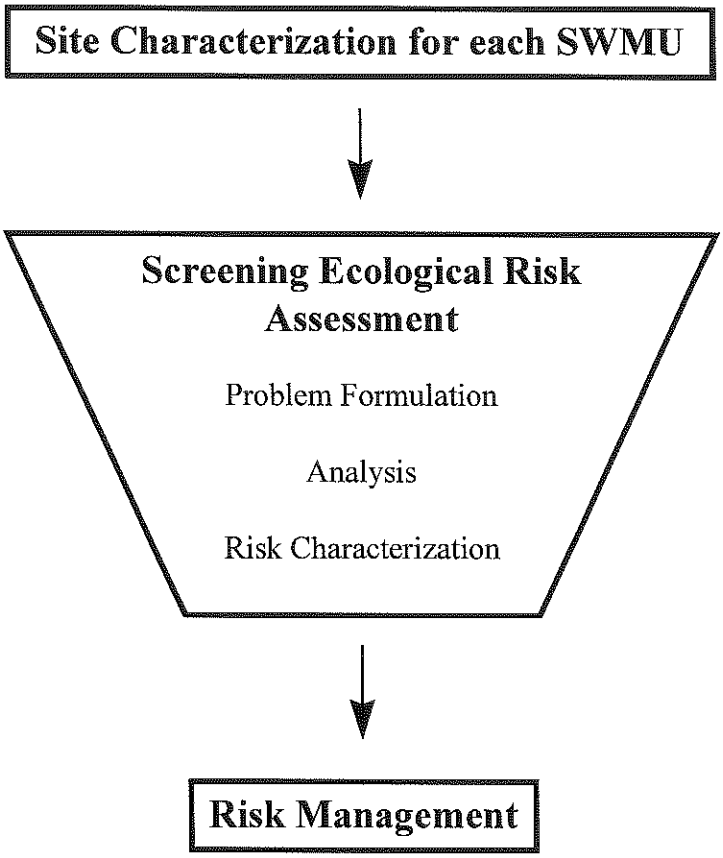


Figure 3: Framework of the Elements of the Screening Ecological Risk Assessment.

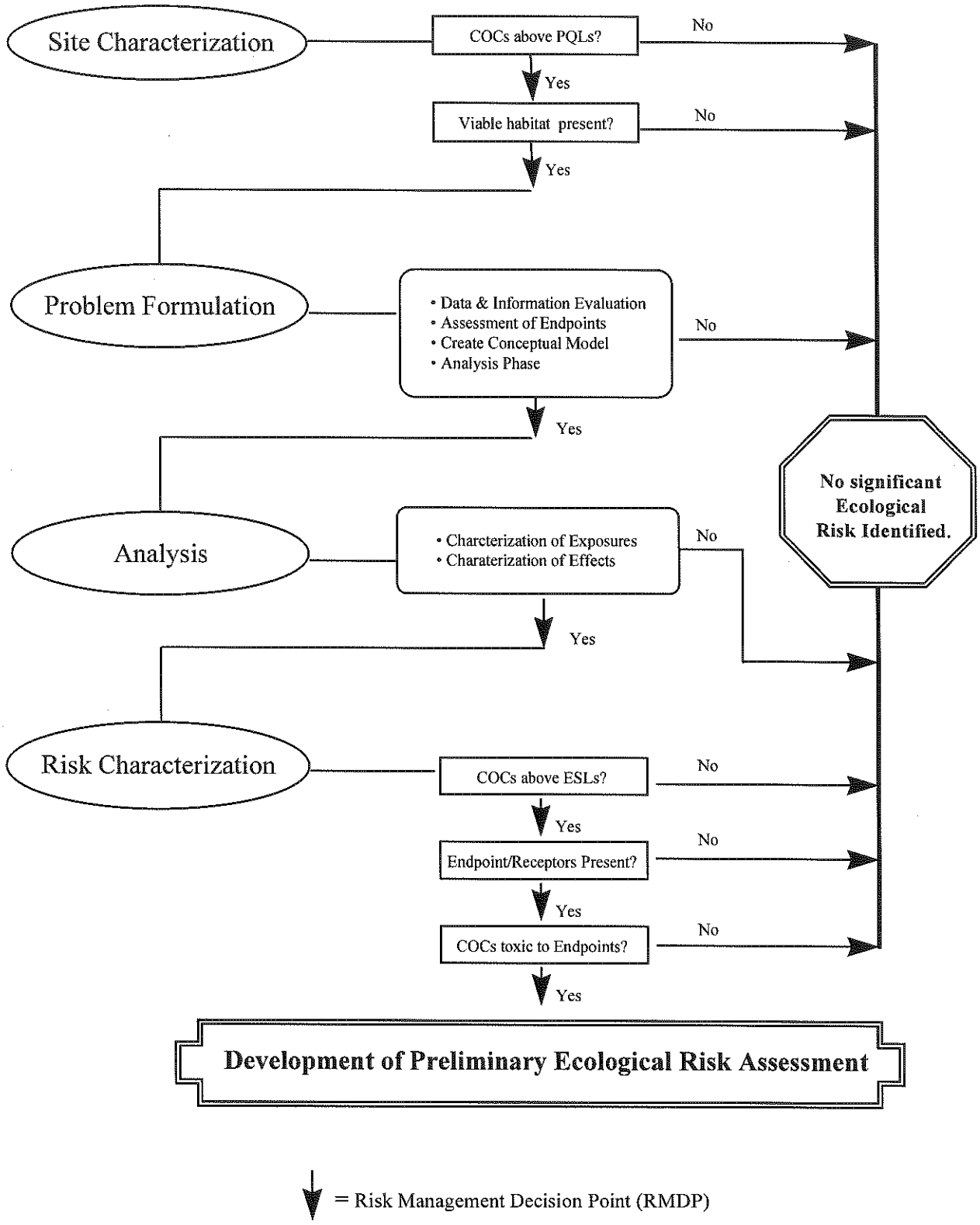


Figure 4: Detailed Elements of the SERA and Opportunities for Risk Management Decision Points.

APPENDIX A

EXAMPLE TABLES

Example Table 1: Constituents of Potential Concern Detected in Soils Above Practical Quantitation Limits

Constituent	Method	PQL mg/kg	Maximum Concentration mg/kg	Location of Maximum Concentration
SWMU X				
Acenaphthene	8270	.2 - .33	5	SO-1
Acenaphthylene	8270	.2 - .33	10	SO-2
Anthracene	8270	.2 - .33	15	SO-3
Arsenic	6010	0.5	20	SO-4
Benzo(a)anthracene	8270	0.005 - .33	10	SO-2
Benzo(a)pyrene	8270	.005 -.33	15	SO-3
Benzo(b)fluoranthene	8270	.005 -.33	20	SO-4
Benzo(g,h,i)perylene	8270	.005 -.33	5	SO-1
Benzo(k)fluoranthene	8270	.005 -.33	10	SO-2
Cadmium	6010	0.1	15	SO-3
Carbazole	8270	.33	20	SO-4
Chromium	6010	0.5	5	SO-1
Chrysene	8270	.002 - .33	10	SO-1
Dibenz(a,h)anthracene	8270	.005 -.33	5	SO-3
Dibenzofuran	8270	.33	10	SO-4
Fluoranthene	8270	.005 -.33	20	SO-2
Fluorene	8270	.2 -.33	5	SO-3
Indeno(1,2,3-cd)pyrene	8270	.005 -.33	5	SO-4
Mercury	7471	0.1	15	SO-2
Naphthalene	8270	.2 - .33	20	SO-3
Phenanthrene	8270	.2 - .33	10	SO-1
Pyrene	8270	.33 - .5	15	SO-2
Selenium	6010	0.5	20	SO-3

Prepared by:_____

Checked by:_____

Notes:

SWMU = Solid Waste Management Unit

PQL = Practical Quantitation Limit from Phase I RFI

mg/kg = milligrams per kilogram

These data do not represent actual data.

Tables will also be developed for other media.

Example Table 2: Screening Levels for Ecological Endpoints/Receptors

Constituents above PQLs	Ecological Soil Screening Level (mg/kg)	Ecological Endpoint/Receptor	Source
SWMU X			
Acenaphthene	20	Plant	ERRAP
Arsenic	2.66	Shrew	ERRAP
Barium	208	Shrew	ERRAP
Cadmium	3	Plant	ET
Chromium	0.4	Plant	ET
Copper	50	Earthworm	ERRAP
Lead	50	Plant	ERRAP
Mercury	0.0185	Earthworm	ERRAP
Nickel	24	Shrew	ERRAP
Selenium	0.79	Plant	ERRAP
Zinc	26.3	Shrew	ERRAP

Prepared by:_____

Checked by:_____

Notes:

mg/kg = milligrams per kilogram

SWMU = Solid Waste Management Unit

These data do not represent actual data.

Sources:

ERRAP = Environmental Restoration Risk Assessment Program, Oak Ridge, TN, July 1996.

ET = Ecotox Thresholds, USEPA Region 5, Chicago, IL, August 1996.

Example Table 3: Potential Ecological Endpoints Present

SWMU	MOC	Land Use/Habitat	Potential Ecological Receptors			
			Mammals	Birds	Reptiles	Insects
X	S GW SW	Deciduous Forest & Open Field	Fox Squirrel White-tailed Deer Coyote Raccoon Praire Vole	Cardinal American Robin Cooper's Hawk Rock Dove	Tree Frog Box Turtle	Earthworm Caddis Fly

Prepared by:_____

Checked by:_____

Notes:

SWMU = Solid Waste Management Unit

MOC = Media of Concern

S = Soil

GW = Ground Water

SW = Surface Water

These data do not represent actual data.

Example Table 4: Comparison of Maximum Concentrations to Ecological Screening Levels

Constituents	Ecological Soil Screening Level (mg/kg)	Maximum Concentration (mg/kg)	Do Constituents Exceed the ESL?
SWMU X			
Acenaphthene	20	5	No
Arsenic	2.66	20	Yes
Barium	208	5	No
Cadmium	3	15	No
Chromium	0.4	5	Yes
Copper	50	15	Yes
Lead	50	5	Yes
Mercury	0.0185	10	Yes
Nickel	24	20	No
Selenium	0.79	15	Yes
Zinc	26.3	20	Yes

Prepared by:_____

Checked by:_____

Notes:

ESL = Ecological Screening Level

mg/kg = milligrams per kilogram

SWMU = Solid Waste Management Unit

-- = Not applicable due to no ESL value

These data do not represent actual data.

Sources:

Environmental Restoration Risk Assessment Program, Oak Ridge, TN, July 1996.

Ecotox Thresholds, USEPA Region 5, Chicago, IL, August 1996.

Example Table 5: Presence of Endpoints with Regard to Constituents That Exceed Ecological Screening Levels

Constituents	Ecological Soil Screening Level (mg/kg)	Maximum Concentration (mg/kg)	ESL Endpoint/Receptor	Present?
SWMU X				
Arsenic	2.66	8.6	Shrew	No
Chromium	0.4	15.9	Fern	Unknown
Copper	50	400	Earthworm	Yes
Lead	50	76.4	Fern	No
Mercury	0.0185	0.25	Earthworm	Yes
Selenium	0.79	1.1	Fern	Unknown
Zinc	26.3	1310	Shrew	No

Prepared by:_____

Checked by:_____

Notes:

ESL = Ecological Screening Level

mg/kg = milligrams per kilogram

SWMU = Solid Waste Management Unit

These data do not represent actual data.

Sources:

Environmental Restoration Risk Assessment Program, Oak Ridge, TN, July 1996.

Ecotox Thresholds, USEPA Region 5, Chicago, IL, August 1996.

Example Table 6: Screening Ecological Risk Assessment Summary

SWMU	Number of Detected Constituents Above PQLs	Number of COECs Above ESLs	Potential Ecological Endpoints/Receptors Present
X	29	7	4
Y	15	2	0
Z	30	8	2

Prepared by:_____

Checked by:_____

Notes:

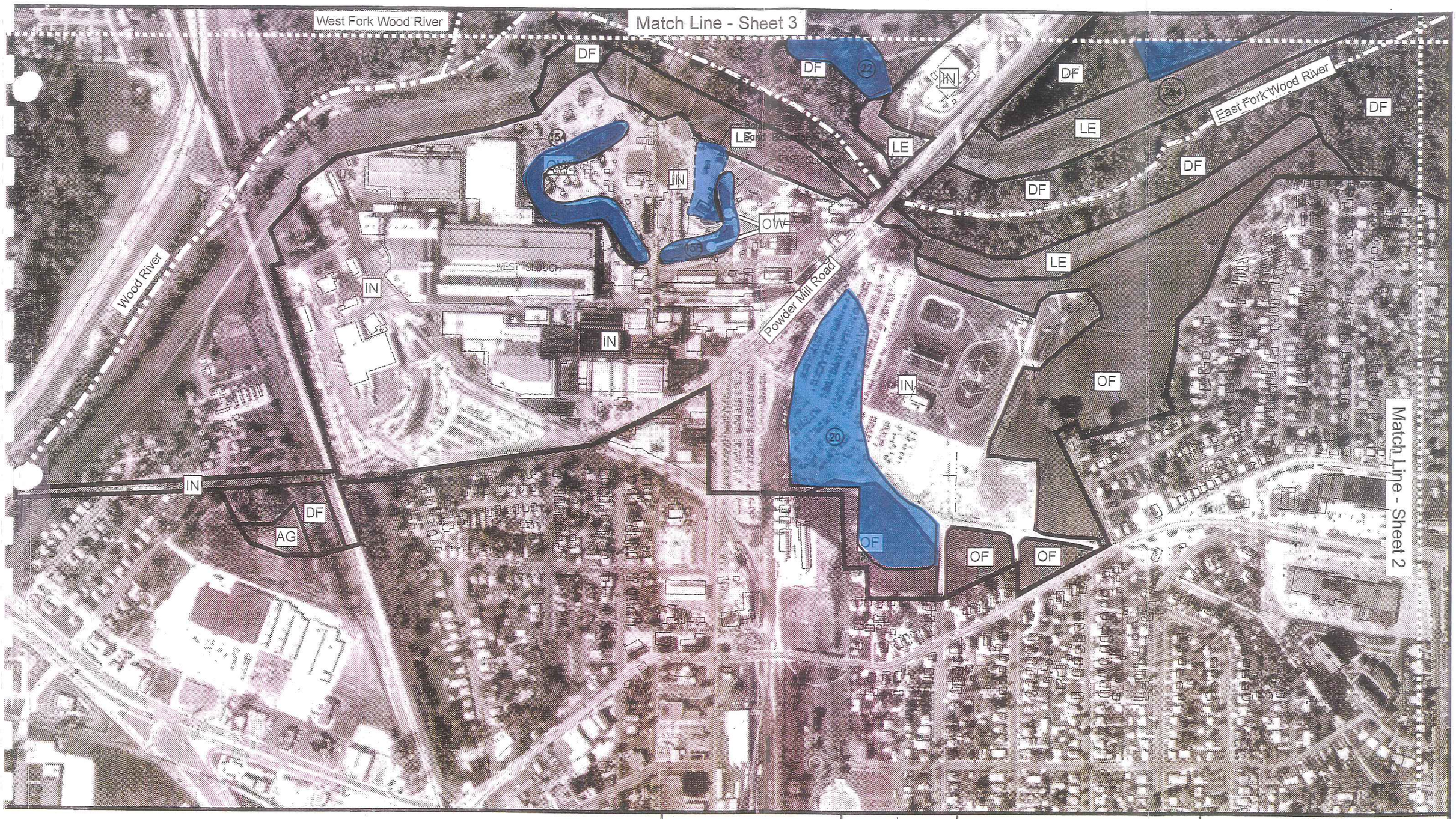
SWMU = Solid Waste Management Unit

COECs = Constituents of Ecological Concern

ESLs = Ecological Screening Levels

APPENDIX B

VEGETATION AND LAND USE FIGURES SHOWING SWMUs



LEGEND

- Approximate Site Boundary
- Agriculture
- DF — Deciduous Forest
- DF(w) — Deciduous Forest / Wet
- EW — Emergent Wetland
- EX — Excavated
- IN — Industrial
- LE — Levee
- OF — Open Field
- OW — Open Water
- RE — Recreation
- SH — Shrub
- WM — Wet Meadow

0 200' 400'

APPROXIMATE SCALE

N

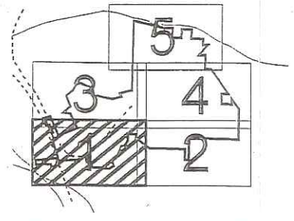


Figure 10-3

(Sheet 1 of 5)

Vegetation and Land Use
Olin Main Plant Facility

Photo Base by: Walker & Associates, April 10, 1991
Prepared by: Terrestrial Environmental Specialists, Inc.

Match Line - Sheet 4

Match Line - Sheet 1

DF

AG

OF

DF

OF

DF

OF

AG

LEGEND

- Approximate Site Boundary
- AG Agriculture
- DF Deciduous Forest
- DF(w) Deciduous Forest / Wet
- EW Emergent Wetland
- EX Excavated
- IN Industrial
- LE Levee
- OF Open Field
- OW Open Water
- RE Recreation
- SH Shrub
- WM Wet Meadow

0 200' 400'

APPROXIMATE SCALE

N

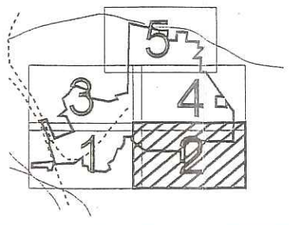


Figure 10-3
(Sheet 2 of 5)

Vegetation and Land Use
Olin Main Plant Facility

Photo Base by: Walker & Associates, April 10, 1991
Prepared by: Terrestrial Environmental Specialists, Inc.

LEGEND

- Approximate Site Boundary
- AG — Agriculture
- DF — Deciduous Forest
- DF(w) — Deciduous Forest / Wet
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- SH — Shrub
- WM — Wet Meadow

0 200' 400'

APPROXIMATE SCALE

N

Figure 10-3
(Sheet 3 of 5)

Vegetation and Land Use
Olin Main Plant Facility

Photo Base by: Walker & Associates, April 10, 1991
Prepared by: Terrestrial Environmental Specialists, Inc.

Match Line - Sheet 5

East Fork Wood River

Powder Mill Road

Match Line - Sheet 3

East Fork Wood River

Match Line - Sheet 2

LEGEND

- Approximate Site Boundary
- AG Agriculture
- DF Deciduous Forest
- DF(w) Deciduous Forest / Wet
- EW Emergent Wetland
- EX Excavated
- IN Industrial
- LE Levee
- OF Open Field
- OW Open Water
- RE Recreation
- SH Shrub
- WM Wet Meadow

0 200' 400'

APPROXIMATE SCALE

N

Figure 10-3

(Sheet 4 of 5)

Vegetation and Land Use
Olin Main Plant Facility

Photo Base by: Walker & Associates, April 10, 1991
Prepared by: Terrestrial Environmental Specialists, Inc.

LEGEND

- Approximate Site Boundary
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- DF — Deciduous Forest
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- EX — Excavated
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- LE — Levee
- OF — Open Field
- OW — Open Water
- RE — Recreation
- SH — Shrub
- WM — Wet Meadow

0 200' 400'

APPROXIMATE SCALE

N

Figure 10-3

(Sheet 5 of 5)

Vegetation and Land Use
Olin Main Plant Facility

Photo Base by: Walker & Associates, April 10, 1991
Prepared by: Terrestrial Environmental Specialists, Inc.